AUTOMOTIVE INDUSTRIES

JULY 15, 1953

AUTOMOTIVE and AVIATION MANUFACTURING
CIVILIAN AND DEFENSE
ENGINEERING • PRODUCTION • MANAGEMENT

In This Issue... **Balancing 90° and 60° V-Six Engines · · · Two New Linkage Power Steering · · · Longest Le Mans Race · · · Chrysler Automatic Transmission · · · Latest Automotive Dynamometer Testing · · New Fan Drive**

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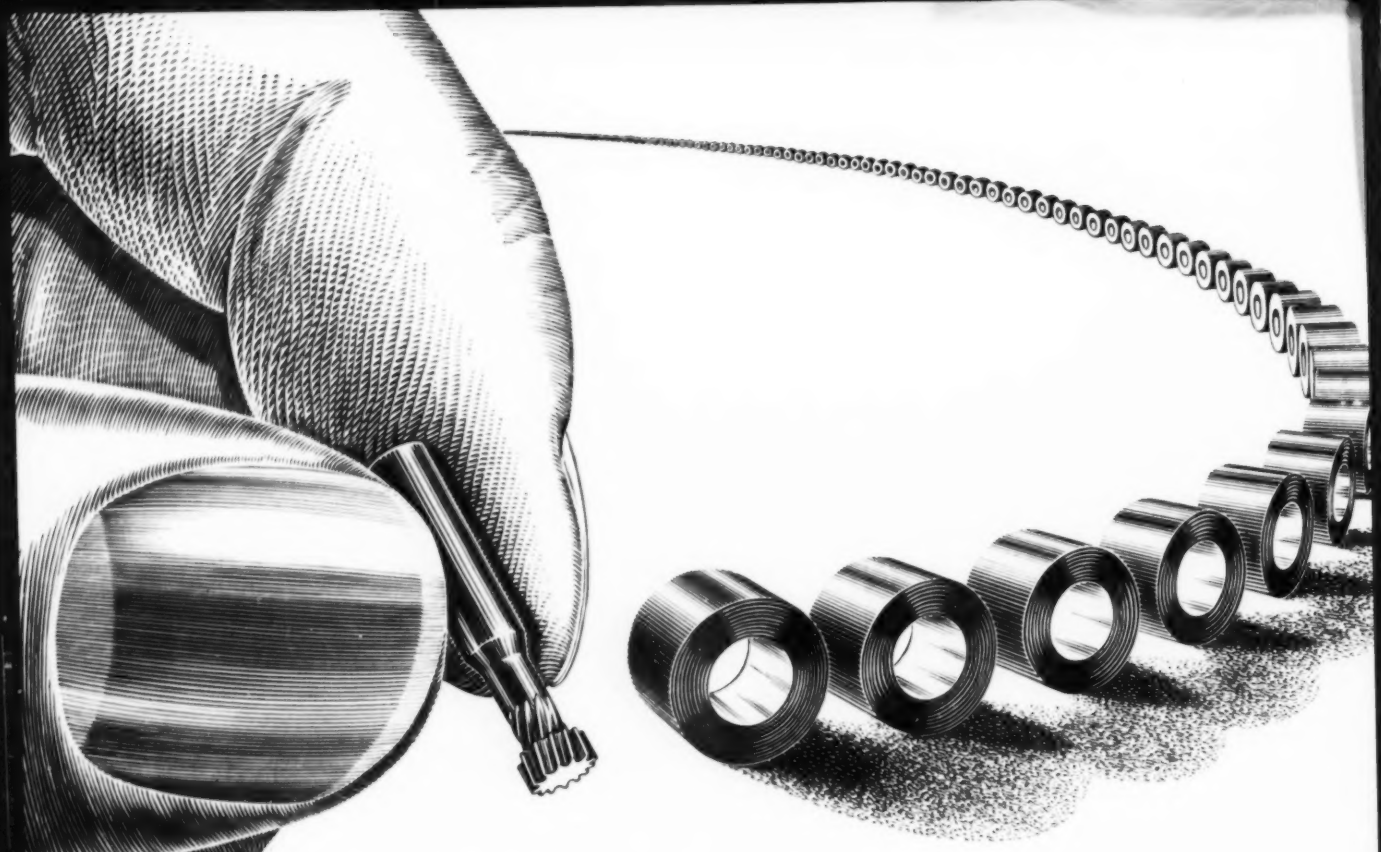
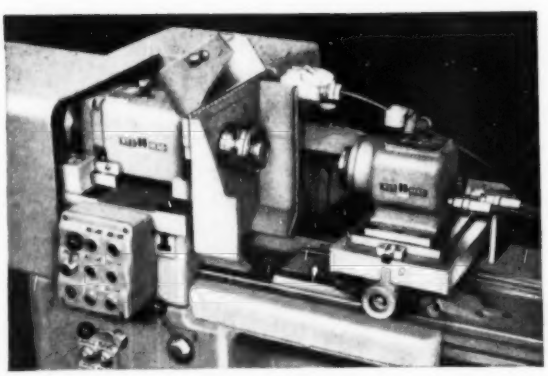


Heald "Burrizing" *finishes* 3,000 BEARINGS ...with only one part scrapped!

The use of a burr instead of a boring tool on a Heald Bore-Matic is somewhat unusual, but when it's practical, interesting things happen. Here's a case in point.

A model 121 Bore-Matic, equipped with a high-frequency grinding wheelhead, uses a $\frac{1}{8}$" shank burr for precision finishing the I.D. of miniature bearing races. Size limits of .0002", .000050" for roundness and .0001" for concentricity are easily held. Three thousand parts have been finished in five, seven-hour shifts – with but a *single scrap part!* Burr is dressed intermittently by a diamond hone and customer reports that tool life lasts up to 5,000 pieces!

Remember – when it comes to precision finishing, it pays to come to Heald.



Internal and Rotary Surface Grinding Machines and Bore-Matics

HEALD

THE HEALD MACHINE COMPANY

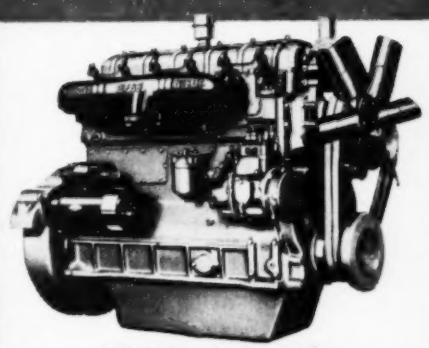
WORCESTER 6, MASSACHUSETTS

Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

WAUKESHA

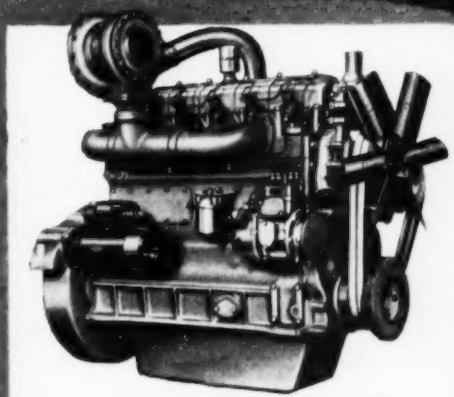
PAYLOAD POWER PLANT

Diesel - 135 Series - *Gasoline*



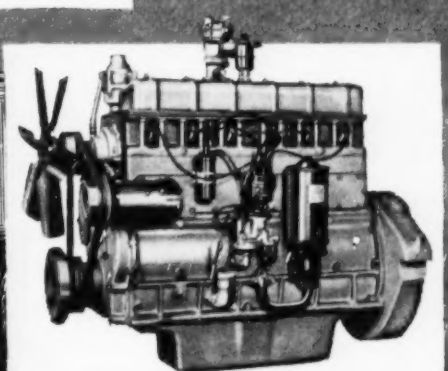
135-DKB—NORMAL DIESEL
426 cu. in. Max. hp 147 @ 2800 rpm.

FAST
SMOOTH
POWERFUL



135-DKBS—TURBOCHARGED DIESEL
426 cu. in. Max. hp 185 @ 2800 rpm.

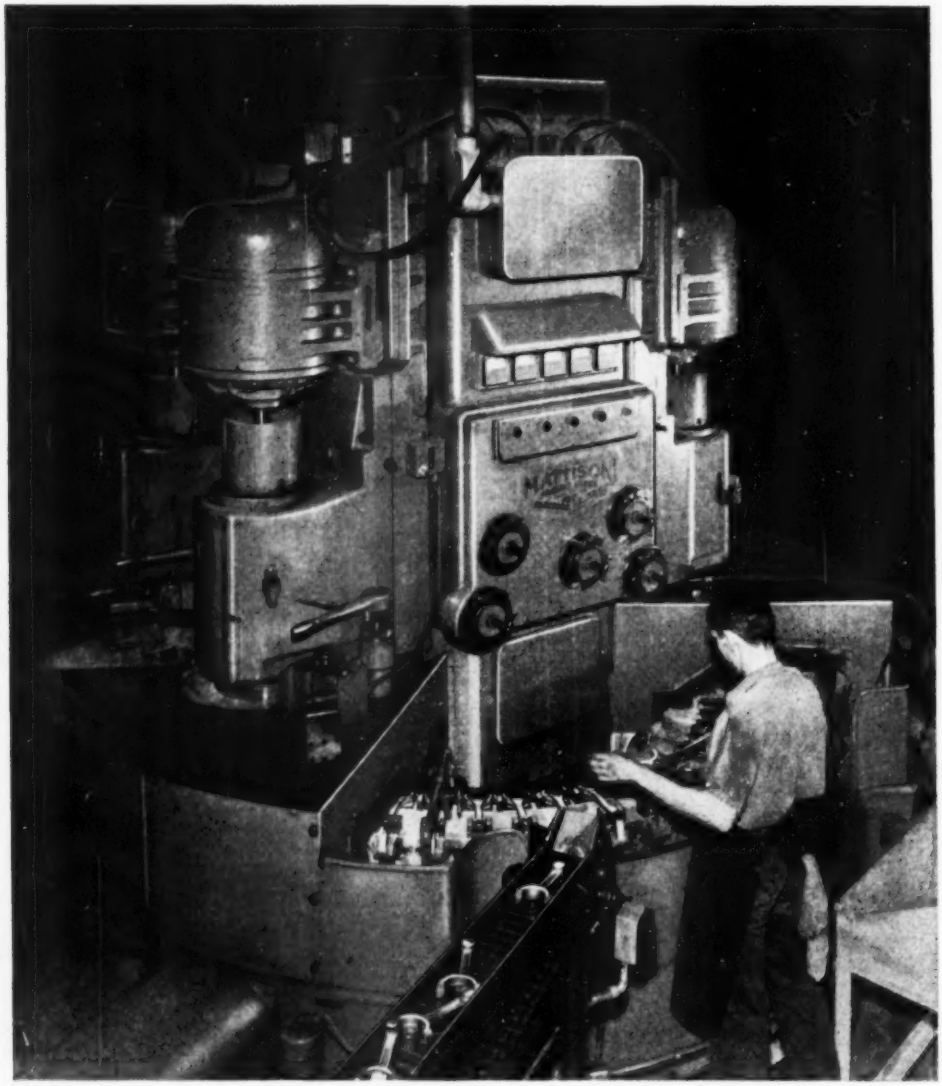
SEND FOR BULLETINS



135-GKB and 135-GZB—GASOLINE
426 and 451 cu. in. Max. hp 147 and 153 @ 2800 rpm.

214

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS. • NEW YORK • TULSA • LOS ANGELES



● At the Cleveland Engine Plant of the Ford Motor Company, both sides of wrist-pin and crank-pin bosses are accurately ground on a high production basis with this five wheel Mattison (Hanchett-Type) Vertical-Spindle Automatic Rotary Surface Grinder. Work pieces are held in automatic clamping fixtures. Automatic sizers are constantly in operation checking the work and keeping all pieces within specified tolerances without operator's attention.

This is only one of the many grinders made by Mattison. Whatever your surface grinding problems may be, write us for our recommendations on the proper method and machine for your job.

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A CHILTON MAGAZINE **AI** PUBLISHED SEMI-MONTHLY

AUTOMOTIVE INDUSTRIES

JULY 15, 1953 VOL. 109, NO. 2

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AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly) founded in 1895, May, 1918.

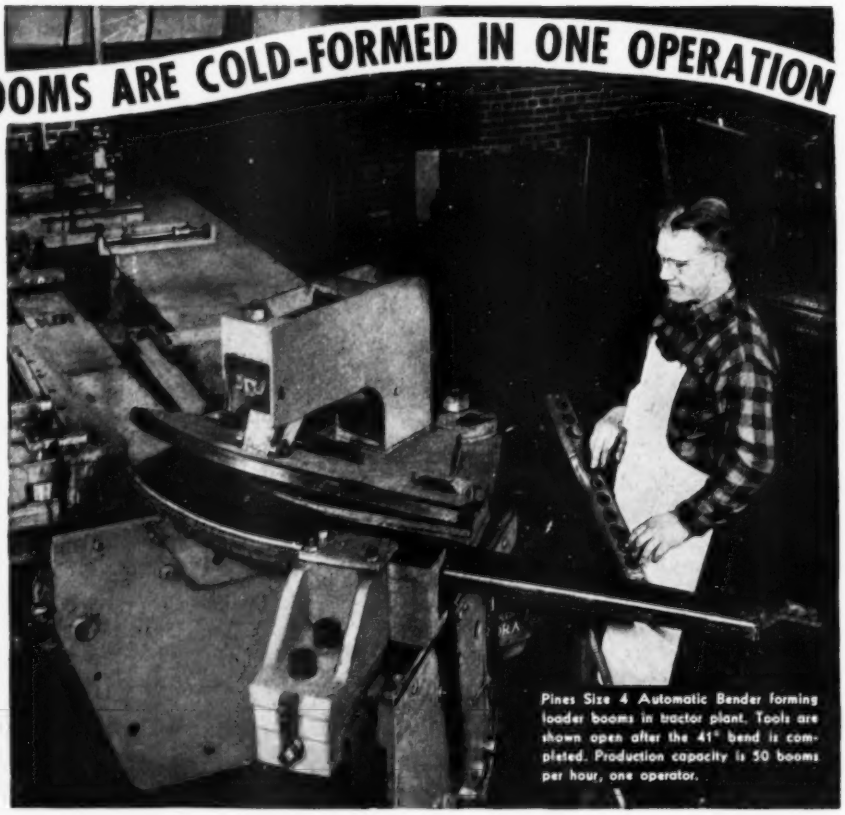
EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, 1 year $2.00, 2 years $3.00. Canadian and Foreign, 1 year $5.00, 2 years $8.00; single copies, 25 cents, except Statistical Issue (Mar. 15th), $1.00.

HOW HOLLOW BOOMS ARE COLD-FORMED IN ONE OPERATION

on a

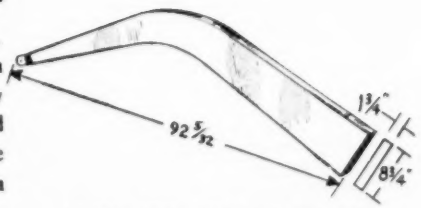
PINES *Automatic* BENDER



Pines Size 4 Automatic Bender forming loader booms in tractor plant. Tools are shown open after the 41° bend is completed. Production capacity is 30 booms per hour, one operator.

41° Edge Bend in Heavy 12-Gauge Stock Simplifies Production Problem

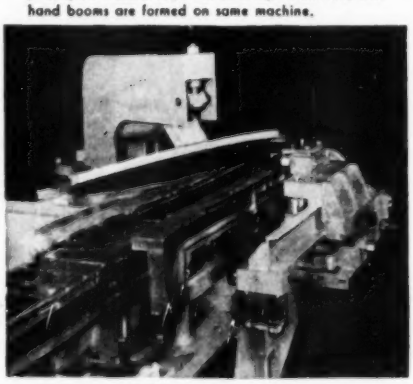
Here's another example of how cold-forming the "Pines-Way" speed. production and lowers costs. The setup illustrated shows tooling on a Size 4 Bender used for edge bending a heavy 12-gauge (.112") hollow tractor loader boom. The pieces are fabricated with a gradual taper, and two straight U-shaped strips are arc-welded together. By adopting the Pines bending method, instead of making curved pieces on a press, a substantial reduction in die cost and scrap losses are affected.



LOADER BOOM FOR FARM TRACTOR
Workpiece is fabricated from two tapered U-shaped pieces, arc-welded together. Both right-hand and left-hand booms are formed on same machine.

Smooth, Accurate Bends Produced in Tapered Section

The Bender and special tooling, engineered by Pines, produces a smooth 41° edge bend to a 34" radius. The draw bending principle employed permits holding close tolerances for easy assembly. By using a flexible floating-type mandrel, tapered to fit the inside of the workpiece, and a separate hydraulically-operated hold-down shoe that works in sequence with the clamping die, wrinkles and buckles are eliminated. One man handles the entire bending operation. The hydraulic bending and return cycle is automatic, push-button controlled.



View of floating-type flexible mandrel and tapered sliding pressure die. Automatic air-operated support holds mandrel in proper alignment on forward stroke, retracts for clamping. Same machine with different tooling also cold bends 3" heavy wall pipe for undercarriage loader supports.

WRITE FOR *Free* DATA SHEETS

To get a better idea of the cost-cutting advantages and unusual versatility of Pines Benders, write today for free copies of "Pines News" illustrating and describing actual bending and tooling techniques on a wide range of jobs.

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Specialists in Tube Fabricating Machinery

BENDING • DEBURRING • CHAMFERING • THREADING • CUT-OFF MACHINERY

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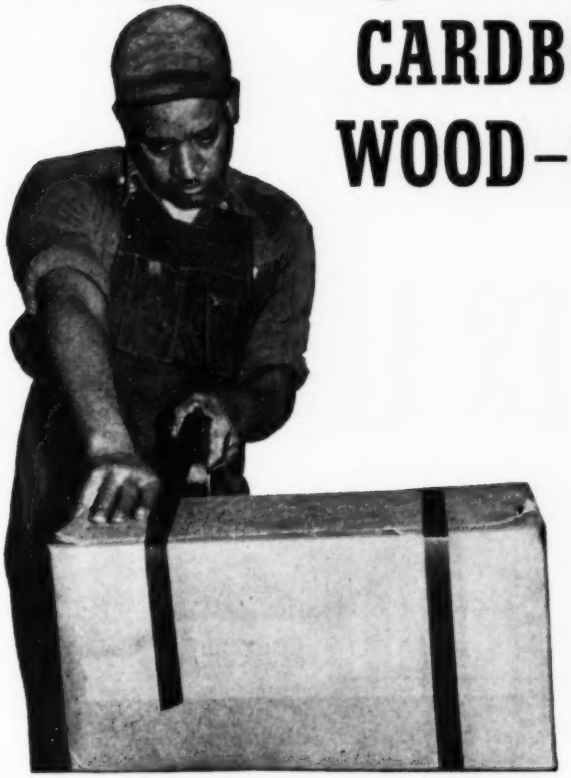
Heavy metal parts now shipped in CARDBOARD instead of WOOD–thanks to new tape!



120-pound cartons are quickly, easily and neatly sealed for shipment with Polyken High Tensile Tape No. 360.

Polyken High Tensile Tape anchors steel feed rolls and sleeve parts for turning lathes inside cardboard cartons.

New Polyken High Tensile Tape slashes shipping costs for Hawker Manufacturing Company

The Hawker Manufacturing Company of Dayton, Ohio, knew they could save important money if their steel lathe parts could be shipped in cardboard cartons instead of wooden crates. The problem was to find a satisfactory way to close and reinforce these cartons.

They tried banding, but the bands cut or crushed the cartons. Besides, the banding was hard to handle, bulky to store, and its application demanded special tools. The high tensile tapes they tried didn't hold. They split, rolled at the edges and didn't provide any resistance to weather.

Then Polyken introduced a new high tensile tape . . . the *only* high tensile tape with a plastic-coated cloth backing. Hawker used it, found it did the job with complete satisfaction.

Here's why new Polyken High Tensile Cloth-Backed Tapes can solve similar problems for you:

This is the only high tensile tape with non-split cloth backing—plastic coated to resist weather.

Excellent adhesive quality fuses tape to the carton without cutting or crushing—provides sure, lasting hold without creep or edge roll.

Application is fast—6 times faster than banding—and no special tools are needed.

The tensile strength: 240 pounds per inch of width.

New Polyken High Tensile Tape is now available in Gloss Black, No. 360, for regular packaging applications and NON-STAINING Gloss White, No. 361, where a protection from staining is required.

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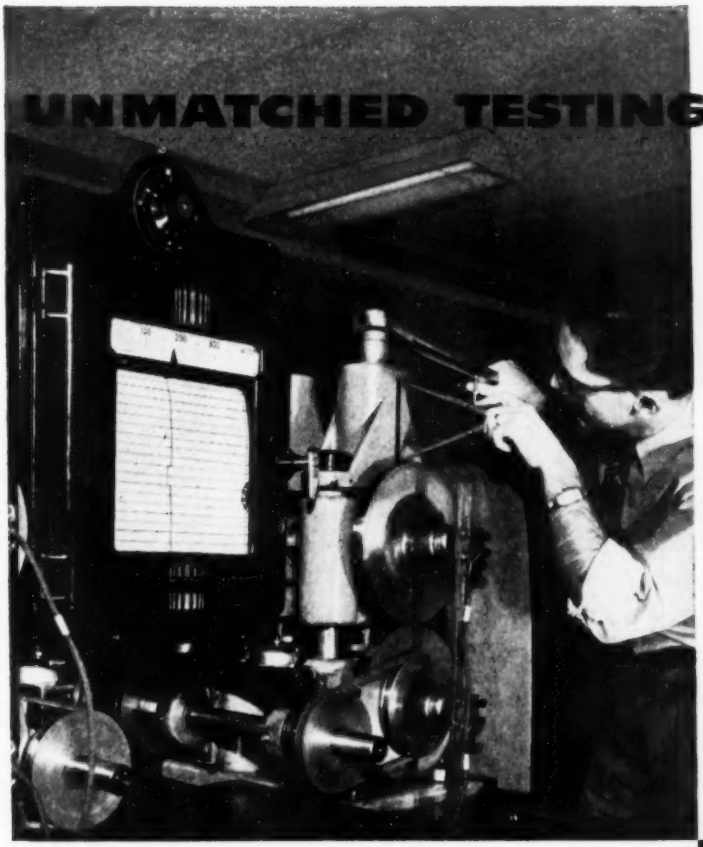

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one of many reasons for Hyatt leadership!

In testing laboratory or manufacturing plant, Hyatt's facilities are second to none. Continued research in methods and materials, and exacting inspection with the finest in modern equipment, has made the Hyatt name a synonym for "highest quality." That's why Hyatt Roller Bearings are so widely used in car, truck and bus applications. Automotive design engineers know that Hyatt bearings have been "performance-proved" for smoother, trouble-free operation and longer life. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J. and Detroit, Michigan.

HYATT ROLLER BEARINGS

UNITED Air Cleaners

Choice for exacting power unit duty

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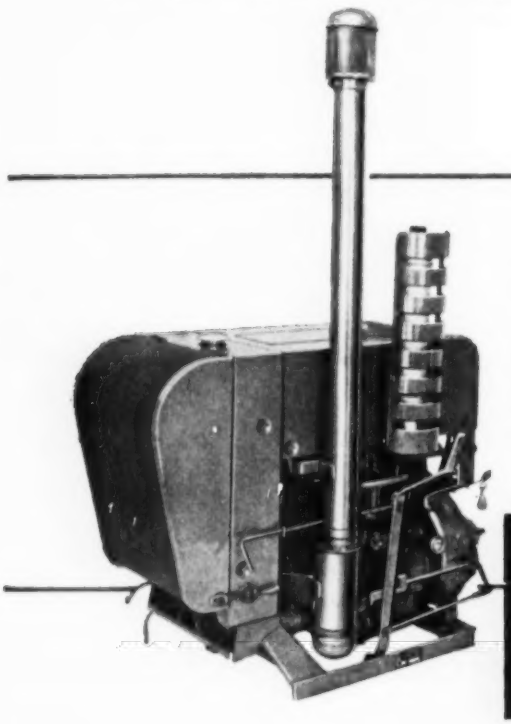
First, the oiled and processed fine mesh screen of the pre-cleaner removes a large percentage of dust before it ever reaches the air cleaner.

Then as the air moves through the oil bath unit, it is thoroughly washed by the turbulent splash action of the oil. When the air reaches the carburetor, it is almost 100 percent dust-free — safe for precision-machined pistons, rings, bearings, cylinder walls.

United Specialties Company builds air cleaners for every kind of internal combustion engine, gasoline or diesel, for power units, automobiles, trucks, tractors and implements. Our sales engineers welcome the opportunity to discuss your requirements.



John Deere equipment is widely known for dependability and long life. Equipped with United Oil Bath Air Cleaner and Pre-Cleaner combination, this John Deere power unit is used on combines and for industrial applications.

UNITED SPECIALTIES COMPANY

United Air Cleaner Division — Chicago 28
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Effortless, responsive power steering of this 40,000 lb. vehicle with 65 m.p.h. top speed is provided by *Ross Hydrapower Model HP-70.*

Trucks, buses, passenger cars, tractors, boats, heavy-duty work vehicles of many types depend on *Ross Steering*—either Cam & Lever Manual or Hydrapower Integral and Linkage types. We invite discussion of *any* steering problem and pledge our best effort and service.

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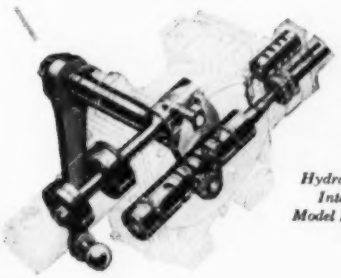

Hydrapower Integral Model HP-70

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SQUEEZE PLAY

35 ton "Hy-Power" Riveter attaching brake backing plate assembly to rear axle housing with cold rivets.

. . . on riveting costs

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"Hy-Power" formed rivets cost less . . .

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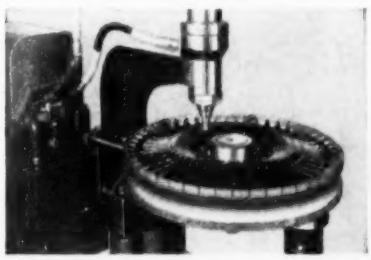
FASTER RIVETING. Even unskilled operators head ⅜" rivets in 2½ seconds. A single control button starts and stops the automatic cycle.

STRONGER JOINTS. This "silent squeeze" method, hot or cold, expands rivets to fill holes completely; forms fillets under both heads for extra strength.

SELF-CONTAINED, QUIET. The Hannifin "Hy-Power" Hydraulic Pressure Generator quietly supplies pressure to the "Hy-Power" cylinder which does the work. These cylinders are available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities.

OTHER OPERATIONS, TOO. In addition to riveting, Hannifin "Hy-Power" equipment is used for staking, punching, forming, pressing and bending. Write for your copy of Bulletin 150.

One man handles this 50-ton "Hy-Power" Riveter with effortless ease in working on railroad car underframes.



A stationary "Hy-Power" Riveter joins hub and runner assembly of hydraulic couplings.

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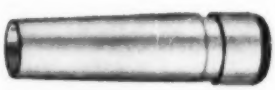
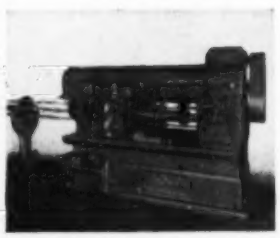
Among the things that your Representative can tell you is how you can be sure that any brand of "automatic", that you may have under consideration, will be equipped to get the most from any modern tool material, including 100% carbide tipped tool applications.

The part illustrated is from regular production runs with HSS and 100% carbide tipped tools. Full particulars are available.



MATERIAL—COPPER: Hole drilled with ½" dia. drill to 3" depth; taper formed on OD.

	HSS	CARBIDE
Cycle Time	45 secs.	16 secs.
Work Spindle Speed	670 R.P.M. at 110 S.F.	2026 R.P.M. at 398 S.F.
Tool Wear	150 pcs. per grind	2500 pcs. per grind



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WELDED STEEL TUBING

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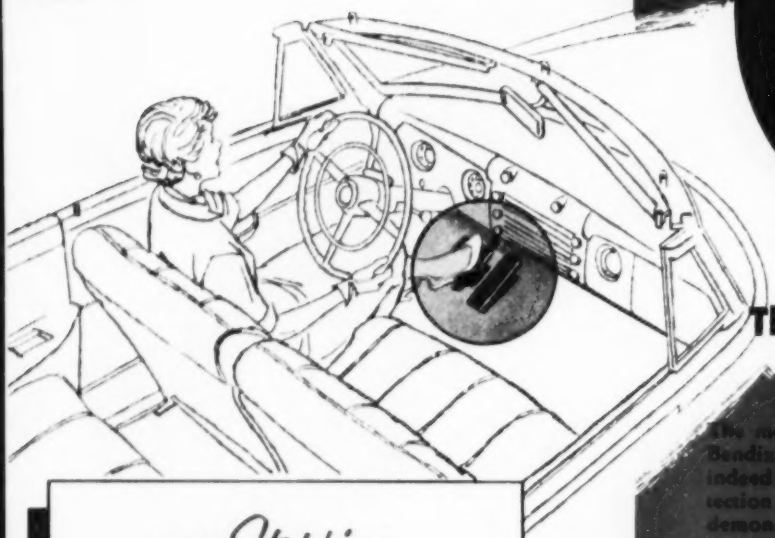


The Only Performance Proven Low Pedal Power Brake!

The moment a prospect steps into a car equipped with a Bendix® Low Pedal Power Brake, he recognizes that here indeed is a new car feature that will provide maximum protection from today's driving hazards. After even the shortest demonstration drive, the effortless, quick and powerful action of the Bendix Low Pedal Power Brake proves to be a new and thrilling experience in motor car control.

That's why STOPS with Bendix Low Pedal Power Brakes—STARTS car manufacturers with a big sales advantage.

This greatest improvement in braking since four-wheel brakes is unique in many ways. It is, for example, the only low pedal power brake that has met the test of millions of miles under all operating conditions. In fact, Bendix Low Pedal Power Brake is specified by more manufacturers than any other make. Remember, too, this new low pedal power brake is the product of Bendix—world's largest producer of power brakes and leader in braking developments since the earliest days of the industry.

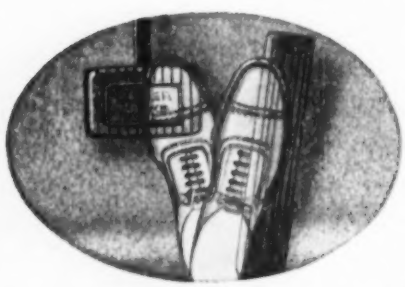
Take advantage of today's trend toward "power" operation by equipping your cars with the performance proved Bendix Low Pedal Power Brake.

BENDIX PRODUCTS DIVISION SOUTH BEND

Bendix

MOST TRUSTED NAME IN BRAKING

NOW *Stopping* IS AS EASY AS *accelerating*



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AUTOMOTIVE INDUSTRIES

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CHILTON CO. (INC.)
Executive Offices
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Philadelphia 39, Pa., U.S.A.

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High Spots of This Issue

★ Longest Le Mans Race

Many types of sports cars were featured among the 60 entries in the recent Le Mans 24-hr road race. Jaguars scored notably high in taking several places. This review summarizes the race results and discusses technical details of the cars. See Page 34.

★ Many Automotive Tests Facilitated by Dynamometers

Long one of the automotive industries' most valuable tools for testing purposes, the dynamometer has done much to advance technical progress. Presented here is a survey of the numerous uses to which this laboratory godsend is put. Page 38.

★ An Evaluation of the 90 Deg V-Six Engine

Two trends appear to be present in automobile design—higher-output eight-cyl engines in large cars and lower-horsepower six-cyl engines in smaller cars. The author analyzes the use of a V, rather than an in-line, engine for the latter. Page 42.

★ Willys' Reactivated Aluminum Forge Plant

Due mainly to the voracious demand for various aluminum aircraft components, the huge forge plant in Erie, Pa., is now running again after being closed since World War II. Described in this article are the wide variety of forgings now made. Page 50.

★ Welding Axle Housings in Automatic Machines

Ranking high among the components turned out by the Chevrolet-Detroit Gear and Axle Div. of General Motors Corp. are banjo-type rear axle housings. The various welds employed in their assembly are covered here from start to finish. Page 54.

★ 40 New Product Items And Other High Spots, Such As:

Design details of the Saginaw linkage type power steering; Gemmer linkage type hydraulic power steering; unique balancing for 60 deg V-Six engine; tremendous demand for power steering and automatic transmissions; Chrysler automatic transmissions; brass radiators with aluminum fins; new drive for radiator fan is thermostatically controlled; flying boats tested in huge steel dock; and anti-friction bearings stabilized in sub-zero refrigerating machines.

Automotive and Aviation News, Page 17
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 109, No. 2 July 15, 1953

Five Year Plan Set for Packard

An intensive study of its operations, with a view toward making certain parts now purchased from suppliers, is being made by Packard. Costs and availability of materials will be the deciding factors. The company under J. J. Nance is preparing to launch a five-year program designed to improve and expand production facilities, accelerate research and engineering development, increase its dealer organization, and enlarge its merchandising program.

The plans call for spending $10 million a year for the next five years in the merchandising area alone. The company is planning to add 250 more dealers to bring its retail organization to 1800 outlets, an increase of 500 from the level prevailing a year ago. During the past year Packard has increased its production sharply.

LIGHT ECONOMY CAR

Shown here is the new Dyna Panhard 54 which has light alloys for chassis, body, and engine and transmission housings to reduce total weight to only 1430 lb. Expected to go into production this fall, the six-passenger, 101-in. wheelbase car has a tread of 51 in. and an interior width of 53 in. both front and rear. The air-cooled 51.8 cu in. engine delivers 42 hp and drives front wheels through a four-speed transmission (the fourth is an overdrive). Mileage is 33 mpg at average speed of 50 mph.

Willow Run Now Largely Idle

Speculation is rife as to disposition of the huge Willow Run, Mich., plant now occupied by Kaiser Motors Corp. With cancellation of Air Force contracts Kaiser had to build two cargo planes, the future of the two million sq ft plant is uncertain.

Eventual transfer of Kaiser and Henry J production from Willow Run to Toledo is a likely prospect. Appointment of Willys Motors' vice-president, Ray Rausch, to head up all Kaiser, Henry J and Willys automotive production is not without significance. Body panels for all lines could be stamped at Willow Run and bodies made there. Kaiser Motors already is moving its purchasing, accounting, export, and certain engineering activities to Toledo for integration with its Willys Motors subsidiary. Sales, parts and accessories, and service operations remain at Willow Run for now. Kaiser said it has suspended car production because of the shortage of transmissions caused by the Borg-Warner strike, and has laid off 2200 automotive workers indefinitely.

Transmissions Back in Production

With output of transmissions resumed last week at Warner Gear Div. at Muncie, Ind., after a 71-day strike, some customers restarted or increased production as units became available. Willys, which had stopped all assembly operations, began again on July 1. Studebaker resumed night shift and truck operations early last week.

Nash closed all its assembly plants for two weeks beginning July 6. Kaiser closed for an indefinite period beginning June 26.

Race for First Sport Car

Chevrolet on June 30 produced its first Corvette sports car with a reinforced plastic body. A special six-chassis line at the Flint assembly plant has a 50-a-month schedule for 1953, with 1000 per month set for next year. Factory list price is $3250 plus tax, including a three-carburetor engine with Powerglide, radio, heater, turn signals, and windshield washer.

Standard color is white, with red trim. The 2900-lb car is 167 in. long on a 102-in. wheelbase. First production models will be used for testing.

Kaiser will start late this month on its Kaiser-Darin K-F 161 plastic car. It will buy the plastic body parts from outside suppliers, and the car may be produced at a supplier plant, possibly in Ionia, Mich.

News of the AUTOMOTIVE

TWO NEW CONVERTIBLES

Two new transport aircraft were introduced recently. The Douglas DC-6C, top, combines cargo facilities of the 6A with passenger features of the 6B. Movable bulkhead and folding seats allow 76 passengers and 2400 lb of cargo, or as much as 26,000 lb of cargo. First in-flight photo of the new Lockheed Super Constellation with turbo-compound engines, bottom, shows its greater length. The 57-to-99-passenger ship will cruise at 335 mph and hit a top speed of 370.

Pratt & Whitney Offers Commercial Turboprop

A Pratt & Whitney gas-turbine engine is being offered for sale to airlines in this country and abroad for the first time.

The axial-flow engine, a commercial version of the company's T-34 turboprop engine, designated the PT2F-1, is rated at 5600 hp. As a military engine, the T-34 has been ordered by both the Navy and the Air Force. The commercial version is said to be suitable for installation in modifications of some current production types of airliners. Fuel consumption reportedly compares favorably with that of piston engines in the highest power ranges.

Kaiser, Nash Agree with UAW-CIO

Kaiser Motors has reached agreement with the UAW-CIO for revision of its contract largely along the lines of the Big Three agreements. Only major exception is that pension provisions are not altered, since Kaiser already provides a maximum of $145 a month, which is higher than provided by other company agreements.

Nash has made some significant changes in its pension program under a revised agreement with the UAW-CIO. It provides that an employe with 10 or more years service does not lose his pension credits when changing employment to another company.

Under terms of the agreement, employes who have accumulated 10 or more years service credit, but who have left the company, will receive pro-rated pensions at age 65, in addition to whatever pensions they may earn in subsequent employment, plus social security. The payment scale, however, is adjusted so that an employe will not receive a larger total pension by changing from Nash to another company which has a pension agreement with the union.

Another change provides that employes who leave the company after 35 years service still will receive a full pension at age 65. Under the old agreement, employes who left the company before reaching minimum retirement age lost all pension credits.

Willys Wants Own Transmission Plant

Willys Motors is seriously considering manufacturing its own transmissions. The company is surveying its Anderson, Ind., plant with a view toward tooling it for supplying at least half its transmission requirements.

R. R. Rausch, Willys vice-president and head of all automobile production for Kaiser Motors, says that from six to nine months would be required to convert the plant. A major consideration would be to insure a supply of transmissions.

Willys has been closed several weeks by a shortage of transmissions caused by a strike at the Muncie, Ind., transmission plant of Warner Gear Div. of Borg-Warner Corp.

Makers Want Office in Dept. of Commerce

Automobile manufacturers have endorsed a proposal that a permanent automotive division be established within the Department of Commerce. Members of the Industry Advisory Committee met in Washington prior to the demise of NPA and suggested that such a department be established and that George Davis, who had headed up the Motor Vehicle Dept. in NPA, be named to head the new unit.

Industry officials, however, made no definite recommendations as to the functions of the new division or of the type and size of staff required. They expressed opposition, however, to the idea of a very large staff and suggested that any definite action be deferred until the industry could come up with some conclusive proposals after serious deliberation.

Better Chrome

Chrome plating on automobiles is going to get progressively better in the months ahead. Restrictions on nickel are slated to be eased and should be off by around the first of December. Even with severe limitations, car makers have been able to improve quality in recent months, and bright work is standing up better than when curbs were first imposed.

AND AVIATION INDUSTRIES

Suppliers Pressed for Changes by GM, Hudson

From all indications, a major styling change will occur in 1954 in the largest GM body shell, used on Cadillac, Oldsmobile 98, and Buick Roadmaster. The corporation is pressing tool and die sources for fast action on work now in their shops.

The change is believed to be rather sweeping, involving a real surprise in styling and design. The change is seen as part of a three-year cycle into which each of three groups of GM body shells would fall consecutively.

Hudson has pushed ahead the date for its model change. The company recently took a quick inventory of parts on hand and notified its suppliers of the advanced model change date. No details are available yet, but it is understood that no radical styling change is in the works.

Cutback Plans for Tanks, Trucks Set by Ordnance

Plans to reduce capacity for the output of military trucks and tanks were announced by the Tank-Automotive Center last week. One source will be retained for each item, based partly on competitive bidding.

Whether Chrysler at Newark, Del., or Fisher Body at Grand Blanc, Mich., will finish contracts for the M-47 tank should be determined by Aug. 15, said Brig. Gen. C. H. Deitrick, T-AC commander. One plant would be shut down by next March, he said. The M-47 will soon be out of production, with Chrysler's Detroit tank plant becoming an Ordnance job shop. M-41 orders are not affected.

Aircooled tank engine output will be confined to Continental Motors plants, with Chrysler and Lycoming-Spencer production cut off. Production of 2½-ton trucks will be bid for by GMC Truck & Coach and Reo. Mack, Diamond T and International Harvester will bid for five-ton truck contracts.

Storage of machine tools will be arranged, Gen. Deitrick said, in Government warehouses adjacent to the closed plants.

Transport Conference Renewed by Ethyl

What to look for in commercial transportation was discussed by technical leaders last month in New York City. Ethyl Corp. sponsored a transportation conference, its first since 1940, for fleet operators and oil company personnel.

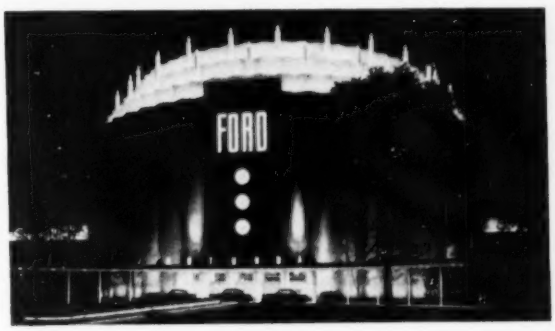
At the first of five meetings around the country, speakers discussed automotive fuels, engine and components development, commercial vehicle design, lubrication and maintenance. Some 240 attended, indicating their interest by the quantity and variety of questions asked. Attendance was evenly divided beween oil firms and fleet operators, with several from manufacturers.

Speakers included V. M. Drews, Fruehauf Trailer Co.; G. A. Round, Socony-Vacuum Oil Co.; V. Young, Eaton Mfg. Co.; A. M. Brenneke, Perfect Circle Corp.; R. K. Christie, Champion Spark Plug Co.; K. F. Deck, Zenith Carburetor Div.; J. A. Moreland, Fifth Ave. Coach Co.; and J. S. Wintringham and M. M. Roensch of Ethyl Corp.

Similar meetings were held in San Francisco, Los Angeles, and Dallas. Another will be held in Chicago on Sept. 9-10.

ROTUNDA RESTORED

Atomic radiation lighted the building and candles as Ford reopened its Rotunda as an exhibition building last month. Interior court is now roofed over.



Ford Ships Steel Further, Larger

The ocean-going freighter, S.S. Selbo, docked at Buffalo, N. Y., last month with ten carloads of Belgian steel for the Ford Motor Co. stamping plant. This is said to be the first time that such steel has come all the way to Buffalo by water.

The importation of the foreign-made steel brought the disclosure that the Ford stamping plant is hard pressed to get enough material to stamp out automobile bodies. Besides Bethlehem Steel, which is supplying the stamping plant with only about 50 per cent of its requirements, the Ford plant has been getting cold rolled sheets from U. S. Steel, Great Lakes Steel and other suppliers, as well as material produced in its own mills at Dearborn, Mich.

The stamping plant, consuming 2400 tons a day, has used some small lots of steel from Belgium in the past, but these shipments have come by rail from the Eastern Seaboard. Several other steel users in the area have brought in steel from Belgium, via the water-rail route. Tonnage has not been large, however.

So urgent is its need for steel that Ford has been paying duty to send hot-rolled sheets to Canadian steel mills, to be put through cold rolling operations.

The heaviest packages of steel ever shipped by the Ford Motor Co. arrived at the Buffalo stamping plant recently. A company spokesman said four coils of cold-rolled sheet steel, each weighing about 20 tons and each almost a mile long, came from Ford's Rouge rolling mill after special arrangements had been made with various carriers to handle the 152,000-lb load. The rail shipment marked completion of one phase of Ford's Steel Div. modernization program announced some time ago.

News of the AUTOMOTIVE

Gould Official Reports on European Batteries

Remarkable improvements have been made in the storage battery industry in Europe, especially in war-battered West Germany, since 1950, according to John L. Rupp, vice-president of Gould-National Batteries, Inc., who recently returned from a tour of England and western Europe.

Mr. Rupp stated that many of the methods and machines he saw on his inspection of battery plants in Sweden, Belgium, Germany, Switzerland, France, and England are surprisingly modern and up-to-date. European batteries are good and cheap, he said, adding that low wages accounted for the low prices.

New Frame Plant

Chevrolet Motor Div. is setting up capacity to build 25 per cent of its passenger car frames in a new 600,000 sq-ft Flint stamping and frame plant. Ground will be broken in August, and the plant is scheduled for completion in 1954. The new structure, to be built adjacent to the Flint assembly and new Flint engine plants, will be No. 28 in the Chevrolet network of manufacturing and assembly plants in 10 states.

About 850 new jobs will be provided in the Frame plant, probably in the last quarter of next year, the announcement said. Chevrolet heavy stampings, such as hoods and fenders, will be moved from downtown Flint to the new plant, while light stampings will continue downtown.

A-C May Take Buda

Preliminary discussions have been held between Allis-Chalmers Mfg. Co. and Buda Co. with a view toward a possible integration of the two firms. What form the transaction would take is not definite, but a stock exchange, merger, consolidation, or acquisition of all Buda assets by Allis-Chalmers, are mentioned as possibilities. The discussions were revealed in a letter sent to Buda stockholders. The Buda firm, located at Harvey, Ill., is a long established producer of gasoline and Diesel engines, materials handling equipment, and railway equipment.

FOR HEAVIER LOADS

Seven experimental light weight coal haulers, top, are made of a new aluminum magnesium alloy with good welding characteristics. Using Alcoa's A545 alloy, the 45-ton capacity unit grosses over four tons less than a previous 40-ton unit. Euclid Road Machinery, the maker, also is experimenting with a rubber tired bulldozer, bottom. All wheels steer and drive the 24-ton unit. Scrapers are said to be loaded faster and with with heavier loads than could normally be obtained.

Wants Advisers Back on Rubber Plant Sales

P. W. Litchfield, board chairman of the Goodyear Tire & Rubber Co., urged that the government call back the three leaders responsible for our wartime success with synthetic rubber.

Litchfield appeared before the Senate Banking and Currency Committee considering legislation to sell 29-government owned synthetic plants to private industry. He said the "big three" of the Special Inquiry Committee, B. M. Baruch, chairman, Dr. J. B. Conant, and Dr. Karl T. Compton, whose basic study of the situation at the time of Pearl Harbor led to the creation of the synthetic program, have the "know-how" to do a comparable job in the changeover.

Hupmobile Triumphs in Old Car Contest

A 1910 Hupmobile, averaging 28.42 mpg, emerged as champion of America's oldest cars in a recent economy test, part of the sixth annual Horseless Carriage Caravan.

A group of the old-timers, all built before 1916, made a trip under their own power from Fresno to Yosemite via Highway 41 recently.

Autocar-White Merger Up to Stockholders

Officers of White Motor Co. and Autocar Co. announced agreement early this month on merger plans. White will acquire Autocar in exchange for 86,500 newly-issued shares of 5¼ per cent voting preferred stock, $100 par value. Holders of Autocar preferred will receive $24.50 of the new White preferred for each $20 par held. Common stockholders will get $12 of the new stock plus a pro rata share of Autocar's Highway Trailer holdings for each share held. Stockholders will vote on the issue.

R. F. Black, White president, said the Ardmore, Pa., firm will be known as the Autocar Div. of White. Combined assets will total $110 million.

AND AVIATION INDUSTRIES

Republic, French Company Sign Jet Parts Contract

Announcement has been made of the signing of an agreement between Republic Aviation (International) S.A., a subsidiary of Republic Aviation Corp., and Societe Nationale de Constructions Aeronautiques Du Sud-Est for the production of spare parts for the F-84F Thunderstreak jet fighter-bomber.

Although the French firm will handle the actual production of aircraft parts, the necessary engineering, tooling and technical data, master tools, sample parts, and equipment will be furnished by the parent company through its new subsidiary in Lugano, Switzerland, which also will be responsible for providing special tooling and give technical assistance and maintain its own rigid inspection system. All parts manufactured by Sud-Est will be interchangeable with those built in the U. S. and will be shipped to all NATO countries using this equipment.

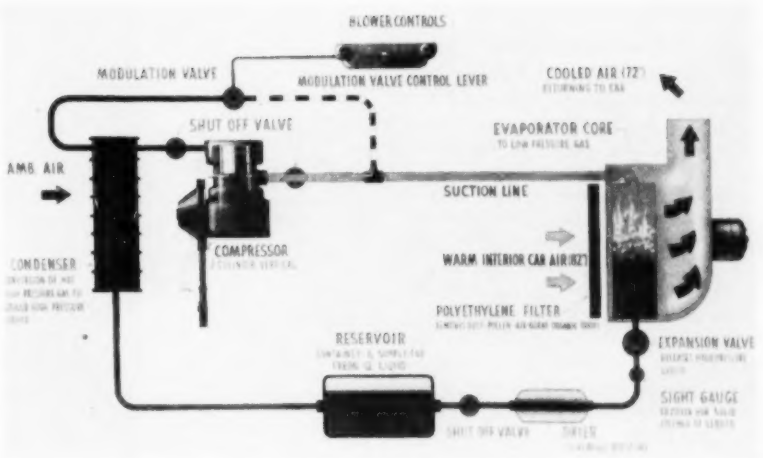
Fiat Jet Parts Project Wins MSA Approval

The Fiat Co. of Italy will produce turbojet engine spare parts for NATO planes, under a $3,470,000 defense support project approved recently by the Mutual Security Agency.

Under the project, funds, programmed for the Italian Government, will be provided in dollar exchange for the purchase of $2,440,000 in machine tools, $450,000 in metalworking machinery, $240,000 in electrical equipment, and $340,000 in other miscellaneous items needed to establish the spare parts production at Fiat. All these items are to be purchased in the U. S.

Payload Record Claimed

A Piasecki H-21C helicopter has flown carrying a useful load of 4610 lb. This is believed to be the heaviest load ever picked up by rotary wings. The aircraft flew at its normal gross weight of 13,300 lb. The company recently started turning out a higher-powered Army version.



TO COOL THE LINCOLN

Lincoln's new air conditioning system takes air from the floor at the rear seat, through a polyethylene filter, to an evaporator in the trunk where it is cooled and returned. The 170-lb unit is made by Novi Equipment Co. List price factory installed is $575.

Power Steering Compromise Seen

Despite any reports to the contrary, Chrysler will not abandon its "full power" steering principle in the new unit for which it is tooling at its Trenton, Mich., plant. Chrysler is too deeply committed to that principle to make any sudden change now, as is General Motors on its position of "feel of the road."

There is some opinion in the industry, however, that eventually both sides will yield a bit, adopt a unit with very slight pressure to give road feel, yet require very little effort from the driver. At present Chrysler is the only exponent of the full power steering.

Studebaker has switched over to hydraulic power steering in place of the mechanical unit which it announced early this year. The integral type unit is supplied by General Motors. Studebaker never supplied its mechanical unit in any appreciable quantities to the field.

One Patent Suit Begun, One Settled at GM

General Motors is suing Electric Auto-Lite for at least $1.5 million, alleging patent infringement. GM is asking triple damages on the basis that the infringement was willful and deliberate after Auto-Lite allegedly refused to negotiate a license agreement for use of patents covering spark plug manufacture.

A Detroit inventor has won his long fight with General Motors, charging infringement of a patent on a folding top mechanism for convertibles. The U. S. Supreme Court, in effect, upheld a lower court decision that General Motors infringed on the patent of J. W. Ackermans and that the inventor should be awarded damages. The award will be decided by the lower court. The infringement is said to cover all convertibles produced between 1950 and 1953.

Army Voices Discontent at Ammunition Allowance

Army ammunition buyers are telling Congress that the $3,395 million tentatively earmarked for procurement of ammunition production facilities falls far short of meeting all-out war requirements. Despite the current build-up of reserve stocks of ammunition and other supplies, the Army says it still will lack, upon completion of deliveries, the stocks required to support its operations in time of war.

News of the AUTOMOTIVE

Fiat Undertakes Mexican Output

Diesel Nacional, S. A., wholly Mexican-financed assembly plant for Fiat cars, has begun national advertising of two models, the Fiat 1400 four-door car and the Topolino two-seater.

The firm received 50 per cent of its finacing from Nacional Financiera, semi-official government credit agency, with the balance of the money put up by private Mexican capital. With production of the Fiats Mexico hails the start of its first national automobile industry. U. S. subsidiaries assemble American makes, but this is said to be the first wholly national plant. (Diesel Nacional) will also produce Fiat passenger buses.

Tire Production Gains Are Seen in Mexico

National production of tires in Mexico is gaining in importance, according to data released by the official Bureau of Statistics of the Department of National Economy.

The five national tire producing plants turned out a total of 364,474 units of different sizes during the second half of 1952. Sales for the period amounted to 362,712 tires.

A breakdown of figures shows the production divided as follows: 180,875 tires for trucks; 183,499 for passenger cars. Sales were recorded by plants as 180,054 tires for trucks and 182,658 for cars.

Military Hardware Tops Procurement

Military buyers are continuing to place particular emphasis on supplies of the "hard goods" of war, latest figures on Armed Forces procurement obligations show.

In the 10 months which ended April 30, all branches of the defense establishment obligated $26.9 billion for major equipment, military building, and plant expansion. Of this amount, $4 of every $5 went into the fighting hardware department, earmarked for the buying of ships, tanks, planes, guns, and similar heavy goods. The actual amount for these goods was $21.9 billion.

FIRST MASS SPORTS CAR

Corvette plastic sports cars began to come off this line at the Chevrolet Flint assembly plant on June 30. Garnish molding was added to prototype first displayed at the GM Motorama in January.

Czech Tractors Offered for Sale in Mexico

Czechoslovakia has apparently started an attempt to invade the Mexican tractor market. Advertisements have appeared recently offering a 25-hp Diesel tractor, but prices or local purchasing sources were not given. Machines were offered by the Motokov Tractor Co. of Prague.

Mexico imports the bulk of approximately 6500 tractors annually from the U. S. One U. S. factory also builds them in the country.

Canadian Fair Draws Record Crowd

Greater buyer participation was the keynote of the recent Canadian International Trade Fair in Toronto, Ont. The sixth annual affair attracted 28,179 business visitors from 59 countries, an increase of 3650 over last year. U. S. business visitors totaled 2182, more than double last year's number. Visitors from the rest of the world also increased considerably.

Standard Oil Adds Testing Facilities

Standard Oil Co. (Indiana) has added a new building—with complete facilities for full-scale engine testing of automotive fuels and lubricants—to its extensive laboratory at Whiting, Ind. In the new unit are 16 engine test stands, each with dynamometer and other modern control and measuring instruments.

Austin Exports to Canada High

Despite reduced production due to the strike at the company's Longbridge Works during the early part of this year, the export of Austin cars to Canada continues at a high level. During the first four months of 1953, 2856 Austin passenger cars were registered in the Dominion.

ASBE Reveals Topics for October Meeting

The American Society of Body Engineers has announced the program for its annual convention in Detroit, Oct. 28 to 30. Sessions the first day will deal with sports cars and body safety. An open house is scheduled for that evening.

The second day's program includes body interiors, purchasing body parts, and body die engineering. The final day's program will include body materials, air conditioning, and development of body engineers.

AND AVIATION INDUSTRIES

Federal-Mogul Traces Growth of Company

Federal-Mogul Corp., in recently announcing its 100th cash dividend since the company was organized in 1924, pointed out some interesting facts about its growth.

Dividends paid since 1924 total more than $11.5 million, in addition to four stock dividends. These were 10 per cent in 1936, three shares for two in 1939 and 1952, and two shares for one in 1947.

The stock was first offered for public sale in 1928 at $20 a share, with 130,000 shares outstanding. A single share purchased at that time would now have increased to five shares with an aggregate current value of approximately $135, would have earned $67.50 in dividends, and equity in the company would have increased from $11.34 to slightly more than $100.

Federal-Mogul currently employs 2800 persons, has a $14 million annual payroll, has 8000 customers, and buys from 500 other companies.

Chrysler Institute Confers 52 Degrees

Chrysler Institute of Engineering has conferred Master of Automotive Engineering degrees on 52 graduate students. Graduation certificates also have been awarded to 35 undergraduates who have completed courses at the Institute.

Kold-Hold Changes Name to Tranter Mfg. Inc.

Kold-Hold Manufacturing Co. of Detroit has changed its corporate name to Tranter Manufacturing, Inc. The company says that its diversified line of products makes the original name inadequate. In addition to its original line of refrigeration equipment, the firm manufactures industrial and domestic heating equipment.

Skyscraper Office

Ford plans to start construction this fall of an eight-story office building to serve its five manufacturing divisions. The multimillion dollar building will be located at the Rouge plant in Dearborn and will contain 340,000 sq ft of floor space. Scheduled to be completed late in 1955, it will house personnel of the engine and foundry, steel, manufacturing services, Dearborn general manufacturing, and metal stamping divisions.

FOR HEAVY PLOWING

John Deere 70 tractor replaces the model G as a heavy duty row crop prime mover. Two-cyl gasoline or all-fuel engines are available, develop 50 belt hp and 44 drawbar hp.

Journal for Colleges to Show GM Engineering

The first issue of a new publication, the *General Motors Engineering Journal*, has just been released. Its objective is to present the most up-to-date GM technical developments for educators and engineering students in colleges and universities. It will be published bimonthly during the school year and once during the midsummer months, and will carry signed articles by GM engineers in the electrical, mechanical, and chemical engineering fields, as well as related scientific subjects.

The publication is designed to help college instructors supplement their teaching material with the latest engineering developments. Arvid F. Jouppi, formerly in charge of technical publications for Sperry Gyroscope Co., is editor.

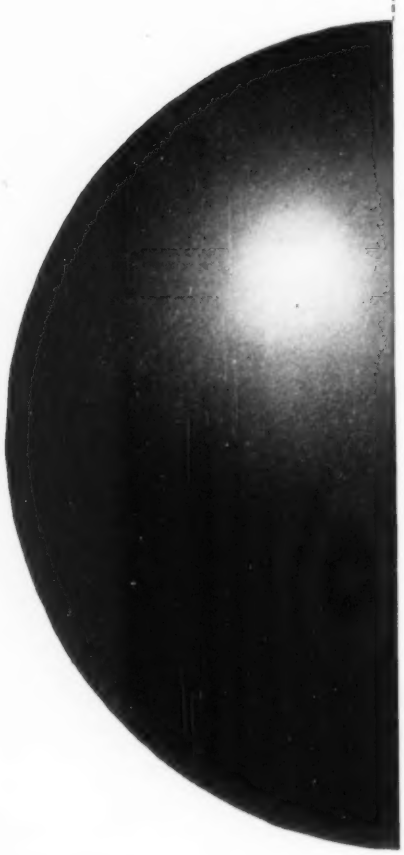
Continued on Page 82

1953 U. S. PASSENGER CAR PRODUCTION

(As reported by the car factories)

	June 1953	May 1953	June 1952	Six Months 1953	Six Months 1952
Chrysler	19,043	15,136	11,705	101,264	67,047
De Soto	13,904	12,469	9,422	73,973	51,062
Dodge	33,505	27,784	23,238	182,243	131,997
Plymouth	66,750	56,367	43,026	341,132	244,071
Total - Chrysler Group	133,202	111,756	87,391	698,612	494,177
Ford	91,453	69,992	67,699	504,707	362,279
Lincoln	5,553	6,542	2,869	27,951	15,480
Mercury	21,963	17,318	17,477	125,279	88,193
Total - Ford Group	118,969	93,852	88,045	657,937	465,952
Buick	52,738	49,182	30,021	277,155	189,072
Cadillac	11,006	10,510	8,859	62,851	47,078
Chevrolet	144,665	139,474	81,793	774,284	461,952
Oldsmobile	38,202	36,550	21,048	196,772	119,179
Pontiac	44,629	42,789	25,258	230,440	142,449
Total - G. M. Group	291,442	278,505	166,979	1,541,482	939,730
Kaiser Motors Group	1,211	3,045	5,760	19,562	31,874
Hudson	6,190	7,364	6,171	50,149	41,178
Nash	14,031	17,017	17,456	106,287	68,385
Packard	9,161	9,783	5,569	59,923	33,288
Studebaker	14,338	22,329	13,164	97,125	69,224
Willys	None	2,494	3,803	24,866	26,013
Total - All Makes	588,544	548,145	394,338	3,256,943	2,189,819

Pattern for Precision



Precision begins with an ideal at New Departure . . . an ideal to achieve the ultimate in perfection. Here, engineering, research and production follow this pattern for precision, and the products of their combined effort—both component parts and completed bearings—are subjected to countless tests and inspections. In fact, many of the instruments used in gauging the accuracy and precision of the bearings were designed and developed by New Departure engineers, and some are exclusive with New Departure. The sensitivity of this equipment is revealed in instances where the sphericity of the cups and cones is held within limits measured in millionths of an inch. And the tolerances for other parts . . . balls, seals and separators...must meet the highest standards. Remember . . . wherever ball bearings are best for the job, the best ball bearings are made by New Departure.

Automatic torque testers, used in New Departure instrument bearing manufacture are ultra-sensitive . . . reduce to a minimum any possibility of human error.

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NEW DEPARTURE

BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

Also Makers of the Famous New Departure Coaster Brake

Men in the News

Gemmer Manufacturing Co.—Eugene F. Wambold has been named vice-president of manufacturing.

Aluminum Industries, Permite Automotive Service Div.—Scott M. Kennedy has been appointed director of sales.

Ex-Cell-O Corp., Pure-Pak Div.—George L. Huffman has been promoted to sales manager.

North American Aviation, Inc.—Robert A. Lovett has been elected a director.

C. M. Hall Lamp Co.—Rupert B. Bell is now chief products engineer.

Campbell, Wyant and Cannon Foundry Co.—Henry McKeen has been named sales manager.

North American Aviation, Inc.—**Albert E. Smyser, Jr.,** has been named eastern public relations representative for the company with offices in New York City.

Caterpillar Tractor Co.—Establishment of general offices at the present East Peoria location and the designation of a Peoria plant has been announced. **C. A. Woodley,** general factory manager at Peoria, has been named manager of the Peoria plant. Other designations include: **R. A. Morgan,** chief accountant; **C. L. Schwyhart,** manager of education and training; **G. W. Torrence,** manager of employee relations; **L. J. Ely,** manager of manufacturing; **M. A. Clements,** manager of parts; and **W. G. Schuller,** purchasing agent. **D. R. Lammers** has been appointed manager of the service department to succeed Clements. Manager of the new plant, whose site has not been determined, is **Warren Kinsey,** employee relations manager at Peoria, now succeeded by Torrence.

Rem-Cru Titanium, Inc.—**C. D. Davis,** president and general manager of Remington Arms Co., formerly chairman of Rem-Cru, has been made honorary chairman of the board. **W. H. Colvin,** president of Crucible Steel Co. of America and former president of Rem-Cru Titanium, Inc., has been elected to chairman of Rem-Cru. Two new board members are **Joel Hunter,** executive vice-president of Crucible, and **H. M. Stoessel,** treasurer of Remington. **W. U. Reisinger,** vice-president and director of finance for Remington, was elected president of Rem-Cru. **J. S. Hoffman,** assistant treasurer of Remington, was appointed treasurer of Rem-Cru. **C. I. Bradford,** director of operations, was made a vice-president. **W. E. Gregg,** formerly assistant treasurer, was made assistant director of operations. **E. P. Redder,** formerly chief accountant, was advanced to assistant treasurer.

American Wheelabrator & Equipment Corp.—**Robert L. Orth** was appointed field sales manager. **Julius E. Skene** was advanced to manager of customer service, and **Philip R. Jordan** was promoted to chief sales engineer. **Gordon R. Bryant** was promoted to district manager of the Detroit Office.

Ford Motor Co.—Appointment of **Luther W. Jenkins** as manager of the industrial relations department and **George C. Nyman** as manager of the quality control department of the Buffalo assembly plant was announced recently. Mr. Jenkins succeeds **Donald D. Hovey,** who has been named supervisor of plant employee services, a new position.

Solar Aircraft Co., Des Moines plants—**Edward H. Gunton,** former manager of the production engineering division, was named to the newly created post of assistant manager in charge of operations. **William Dixon** replaces Gunton as production engineering division manager. He was formerly assistant manager of this division. **Marvin L. Nelson** was appointed head of a newly organized quality control division. He was previously manager of the engineering division.

Fruehauf Trailer Co.—Appointments of **Alexander S. Aranyos** as director of export sales and **Cort Cromwell** as export manager have been revealed.

(*Turn to page* 187, *please*)

Necrology

Edward P. Bullard, Jr., 79, former president and chairman emeritus of The Bullard Co., died June 26 at Fairfield, Conn.

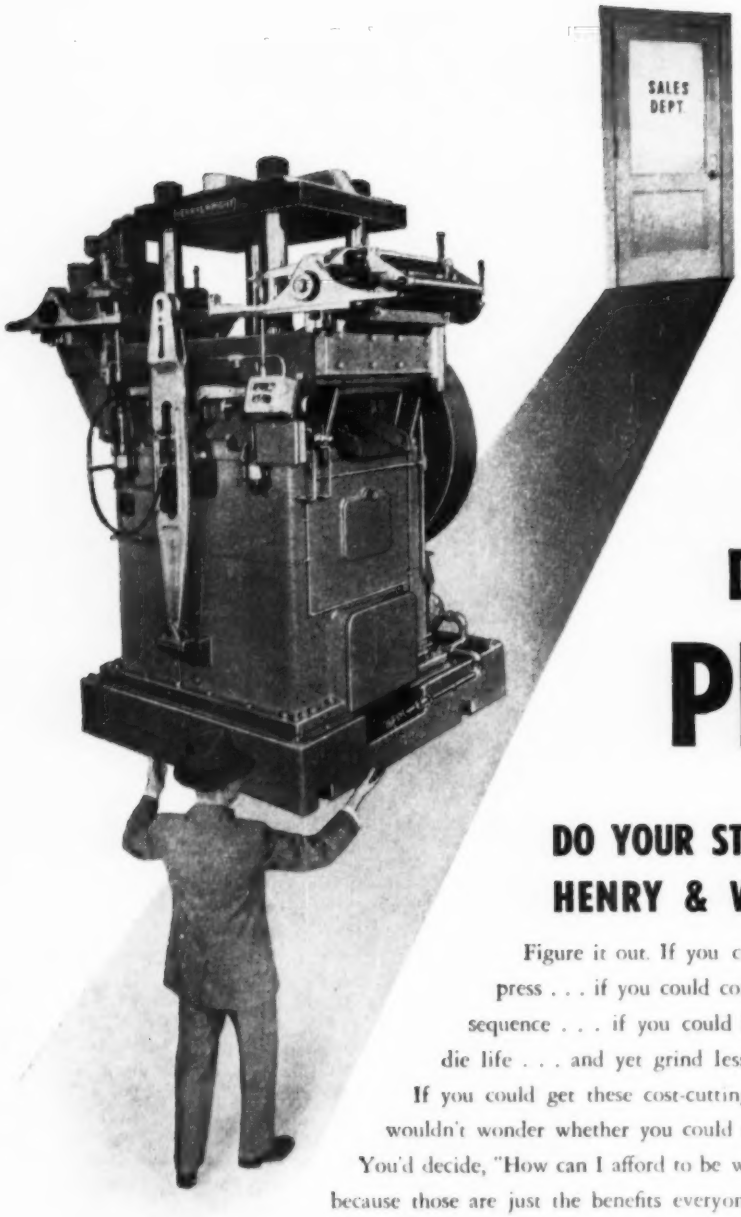
David J. Vail, vice-president and sales manager of Campbell, Wyant & Cannon Foundry Co., died on May 18.

Wilmer A. Hagen, 51, general sales manager of the United Motors Service Div. of General Motors Corp., died June 25 on a business trip to Philadelphia.

Nathan L. Miller, 84, general counsel of U. S. Steel Corp., died June 26 at New York.

Stuart Nixon, 53, research engineer with Sealed Power Corp., died June 9 at Muskegon, Mich.

Pierre I Chandeysson, 78, founder and president of Chandeysson Electric Co., died June 5 at St. Louis, Mo.



RUSH YOUR SALES DEPARTMENT A PRICE CUT

DO YOUR STAMPING PROGRESSIVELY ON HENRY & WRIGHT DIEING MACHINES

Figure it out. If you could produce dozens of different jobs on one press . . . if you could combine separate operations into one progressive sequence . . . if you could improve accuracy, get higher speeds with longer die life . . . and yet grind less metal off the die to sharpen it . . .

If you could get these cost-cutting, labor-saving, inspection-reducing benefits, you wouldn't wonder whether you could afford a Henry & Wright Dieing Machine now. You'd decide, "How can I afford to be without it now?" Well, let's talk serious business, because those are just the benefits everyone gets with Henry & Wright Dieing Machines —and, brother, how the Sales Department will love that price cut you'll give them.

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Only the best is good enough

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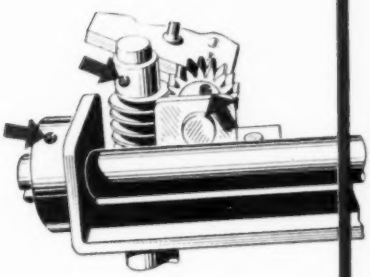
DIVISION OF EMHART MFG. CO.

HARTFORD 1, CONNECTICUT

NEW CATALOG Get up-to-the-minute facts on Dieing Machines — capacities range from 25 tons to 2500 tons. Write Henry & Wright, 491 Windsor St., Hartford, Conn.



A typical application, not included in the pilotless bomber above. Rollpin is driven into standard holes, compressing as driven. No taper reaming is required. Rollpin fits flush . . . is vibration-proof.

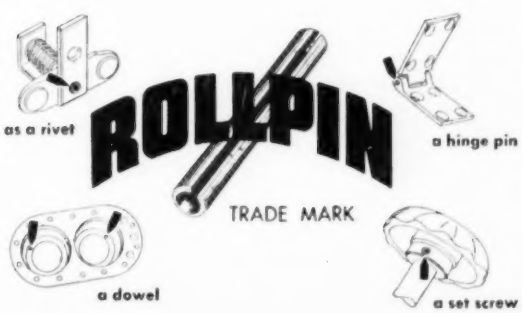
ROLLPINS saved The Glenn L. Martin Co. $6,300

The Glenn L. Martin Company cut fastening costs on a single missiles contract by $6,300, as compared to dowel pins . . . by $11,700 as compared to taper pins! These installed cost savings, recently announced to Company engineers, were made possible by the use of just 90 Rollpins per unit.

ESNA Rollpin is the slotted tubular steel pin with chamfered ends. It is simply driven into standard holes, compressing as driven. The Rollpin's spring action locks it in place—regardless of impact loading, stress reversals or severe vibration—that's why Martin was able to make these savings on this contract for pilotless bombers.

No precision-drilling, threading or peening . . . no extra operations!

If you use locating dowels, hinge pins, rivets, set screws . . . or straight, knurled, tapered or cotter-type pins—Rollpin can cut your costs, too. Just mail the coupon for design information.



Dept. R2'-75, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, New Jersey

Please send the following free fastening information:

☐ Rollpin Bulletin

☐ Elastic Stop nut bulletin

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name_____ Title_____

Firm_____

Street_____

City_____ Zone____ State_____

LIMITLESS HORIZONS IN SPRING DESIGN
top 10 SOURCES for Mechanical Springs
WALLACE BARNES COMPANY
BRISTOL, CONNECTICUT
THE WILLIAM D. GIBSON COMPANY
1900 CLYBOURN AVE. CHICAGO 14
RAYMOND Manufacturing COMPANY
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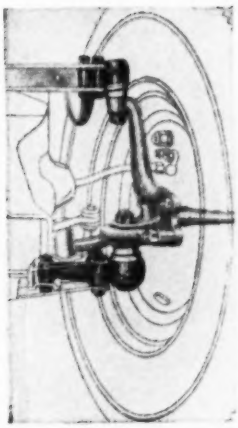
DIVISIONS OF ASSOCIATED SPRING CORPORATION

FLOYD CLYMER REPORTS ON

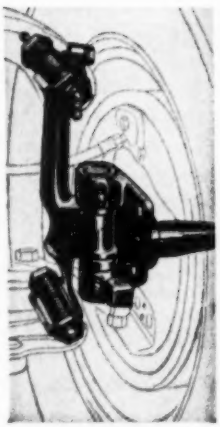
Thompson Front Suspension Ball Joints

"The car steers almost as easily while in motion as if it were equipped with power steering and easier at all speeds than most cars of comparable weight".

. . . from Mr. Clymer's Popular Mechanics report on the 1952 Lincoln, with whose engineers Thompson Steering experts worked in the development of its new front suspension ball joints.



Thompson Front Suspension Ball Joint



Standard King Pin Type Suspension

Lubrication points are reduced from approximately five to two fittings per side.

Six major automotive problems solved

- Reducing turning resistance for *much* easier steering.
- Creating new space for wider modern engine design.
- Cutting the manufacturers assembly line time.
- Eliminating front end suspension bind.
- Reducing lubrication points from 12 to 4.
- Increasing service life *many times over.*

. . . Showing what Thompson Engineers can do when you put them on your Team!

If you have a steering problem you'd like to talk about, write, phone or wire Thompson Products, Inc., Detroit Division, 7881 Conant Ave., Detroit 11, Michigan.

You can count on

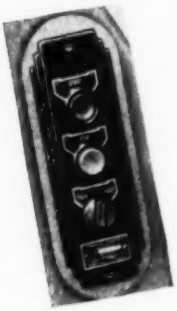
Thompson Products

MICHIGAN PLANT

DETROIT • FRUITPORT • PORTLAND

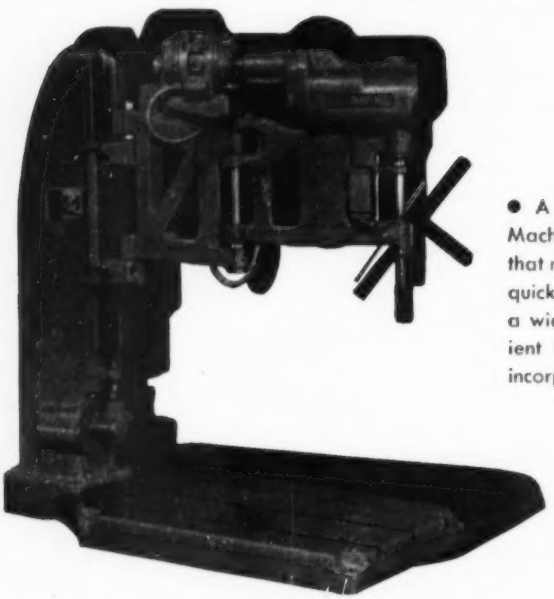
FOOTBURT

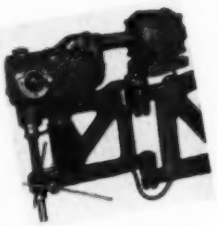
machine tools
for *increased*
production



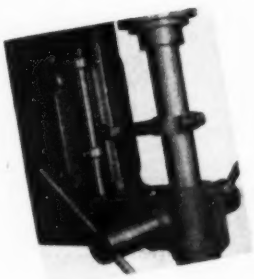
● Here is a machine designed to perform light drilling and tapping operations at high speed with minimum of effort. Any one of six spindle speeds may be quickly selected and tapping is always instantly available without any adjustments to the machine. It makes an excellent choice for miscellaneous work on a large layout of varying size holes.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio
Detroit Office: General Motors Building





● A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.



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FOOTBURT

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New Asbestos-Neoprene Sheet Packing is Both Compressible and Heat Resistant

Where heretofore you've had to sacrifice compressibility or heat resistance in standard sealing materials for oil, greases, water, gasoline, etc., now ASBESTOPRENE #233 combines these properties to a very useful and satisfactory degree. In addition, ASBESTOPRENE #233 shows marked improvement in other characteristics over the usual compromise specifications such as gelatin-treated paper or cork. It is better in corrosion and fungus resistance . . . in torque loss . . . and dimensional stability.

A Victor Quality Product — in Sheets or Finished Gaskets

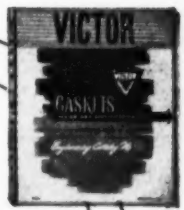
Base material of ASBESTOPRENE #233 is a selected long asbestos fiber. It is felted and bonded in complete homogeneity by a beater impregnation process with a new heat-and-oil resisting neoprene latex.

Victor die-cutting techniques assure accurate manufacture, fast delivery, and important economies on all gasket orders whether large or small production runs. ASBESTOPRENE #233 is also available in sheets.

Complete Specifications and Sample Sent on Request

Your own tests will convince you ASBESTOPRENE #233 is the best packing in its class for recommended applications. Get all the facts through your Victor Field Engineer, or by direct inquiry to the Victor Company.

Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Illinois



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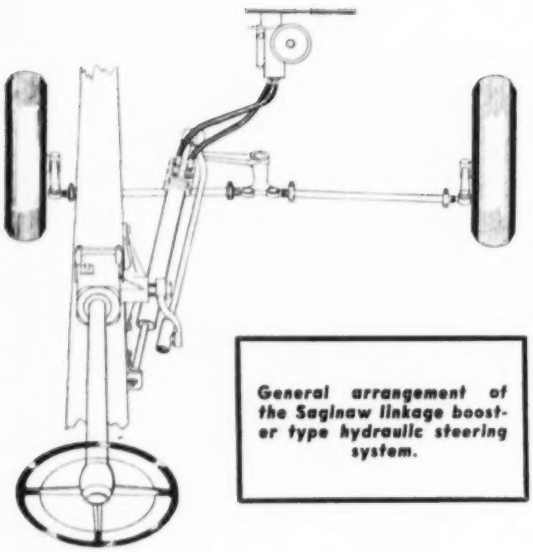
Supplied to Design Engineers by request on business letterhead.

VICTOR GASKETS • PACKINGS • OIL SEALS
SEALING PRODUCTS *EXCLUSIVELY*

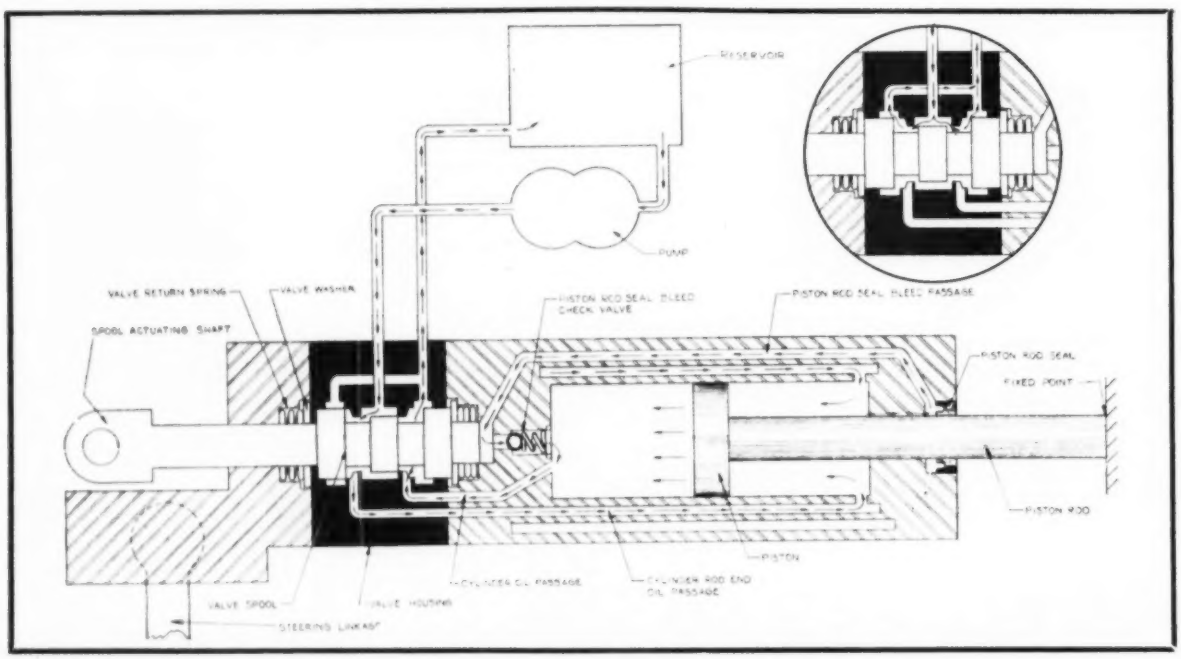
Design of the Saginaw Linkage Type Power Steering



General arrangement of the Saginaw linkage booster type hydraulic steering system.

DETAILS of the Saginaw linkage booster type hydraulic steering system, made by the Saginaw Steering Gear Div., GMC, have recently been released. According to a company spokesman, a unit of the type described here has been adopted by one of the independent automobile manufacturers, and is now in production at Saginaw. This division also has designed and is completing the tooling for two heavy duty units for application on motor trucks.

The Saginaw linkage booster type unit, illustrated here, is applied to a fore-and-aft steering linkage and has the valve and cylinder in an integral power package. It functions in a manner somewhat similar to that of the Saginaw integral steering gear, using a source of hydraulic power which feeds fluid to the control valve through an inlet or pressure port, the fluid being returned through the return port. The power source and booster are interconnected by means of flexible hose. (*Turn to page* 95, *please*)



Flow of hydraulic fluid in the system when making left turn as described in text. Inset shows flow of fluid when valve is in neutral position.

Gemmer Linkage Type Hydraulic Power Steering

FIRST announcement of the new Hydraguide linkage type hydraulic power steering system was made by C. F. Hammond, vice-pres., engineering, Gemmer Mfg. Co., at the SAE Summer Meeting last month. As will be seen in Fig. 1, it is a compact, self-contained unit fitting snugly in the steering linkage. According to the company, the application of its linkage type unit is aimed at cars in smaller and lighter weight classification with overall steering ratios about the same as accepted manual ratios.

In common with the present integral type Hydraguide steering gear, the linkage type is designed to provide power under all conditions when the engine is running. Otherwise, it is distinctive in design and application, as may be noted from the illustrations reproduced here. Incidentally, this mechanism has been produced only experimentally up to this time.

One of the distinctive features of the unit is a design which incorporates two piston rods of large mass and size, having equal piston areas within the cylinder. The entire assembly is attached to the chassis frame, each piston end being fastened to a frame bracket. Not only does this provide a positive anchorage and alignment, it also relieves the steering linkage of the weight of the power mechanism.

The valve mechanism, seen in Fig. 2 and Fig. 3, is made an integral part of the slidable cylinder assembly, moving with the cylinder to the right or the left depending upon the maneuver. As shown in Fig. 2 the valve is actuated by the short steering link which, in turn, is connected directly to the pitman arm. This link is held in constant axial position, parallel to the movement of the cylinder by means of the sealed

(*Turn to page* 98, *please*)

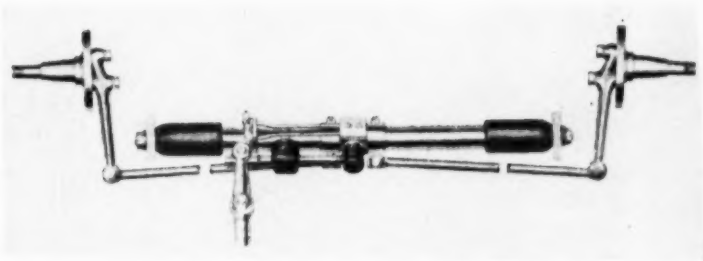


Fig. 1—Plan view of the Hydraguide linkage type system and its connection to the manual steering gear and the front wheels. Note that the entire unit is supported at both ends by the chassis frame.

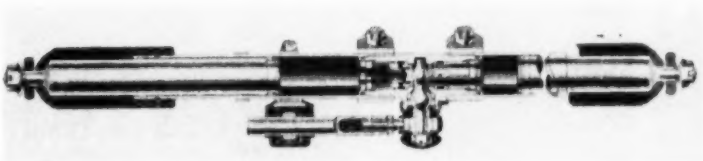


Fig. 2—Cross-section through the linkage unit, showing detail of the piston rods, control valve assembly and cylinder, and protective sealing arrangement.

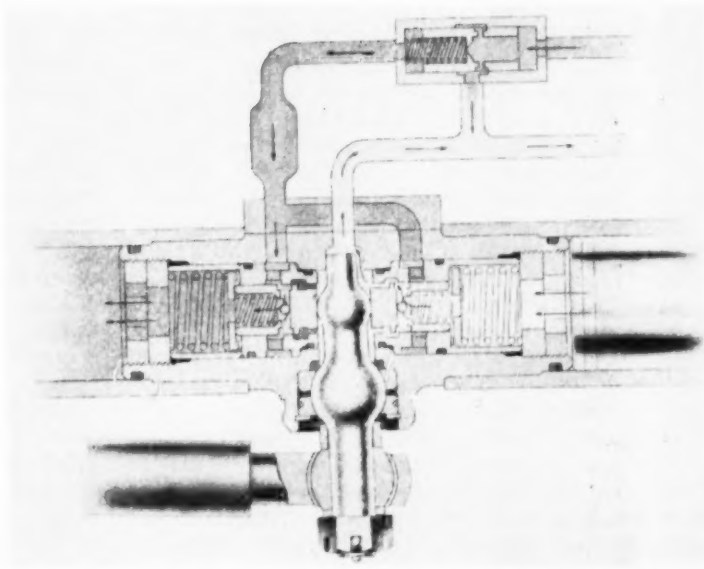


Fig. 3—Cross-section through the control valve, indicating the flow of pressure fluid for a given maneuver, and showing the details of the valve and method of actuation.

Drivers rush toward their cars just before the start of the race. United Press photo.

Longest Le Mans

Cars of All Types Competed in 24-Hour Road Race to Set New Records for Distance Covered

LE MANS, FRANCE

With sixty entries, the majority of them direct from manufacturers, for the 24-hour road race held June 13 and 14 at Le Mans, France, and the possibility of getting as many more had conditions permitted, there is undeniable proof of the popularity of the sports type of automobile in Europe.

The competitors included a Cunningham team from U.S.A., and the Healey-Nash British-American combination. English makers were Jaguar, Aston-Martin, Austin, Bristol, Frazer Nash, and Allard using a Cadillac engine. French makers were Renault, Panhard, Talbot and Gordini. Italy was represented by Alfa-Romeo, Ferrari, Lancia, Osca and Fiat; Germany had a reduced representation with Porsche and Borgward, and Spain had one firm.

Every type of automobile figured, from the flat twin Panhards of 37 cu in. to the Cunninghams with Chrysler engines and the Allards powered by Cadillac. Two cylinders, four cylinders, straight sixes, V-sixes, straight eights, V-eights and twelves were all represented. While interest was centered on the high-speed cars with engines of 183 cu in. or more, an attempt was made to put all on an equal basis by a formula based on piston displacement. Under this the piston displacement of supercharged engines was doubled.

The only complete teams to finish were the Jaguars which came in first, second, fourth, and ninth, and the Cunninghams which finished third, seventh, and tenth. The Italians failed to live up to expectations, the entire Alfa-Romeo team going out with various mechanical defects, Ferrari losing three out of four, and Lancia losing all four cars. The French teams also were disappointing, Talbot losing three out of four cars and Gordini finishing one in sixth place and losing two others. Apart from Jaguar, the English entries also failed to stand the grind, all the Aston-Martins being forced out with mechanical troubles, the two Bristols breaking connecting rods, and the Allards being eliminated early. The Nash-Healey finished eleventh, while the Austin-Healeys came in respectively twelfth and fourteenth. Results of the race appeared in the July 1 issue of AUTOMOTIVE INDUSTRIES, page 37.

Although the automobiles are all on sale to the general public, they cannot be considered as stock cars in the American sense. The types vary enormously,

The winning Jaguar which covered 2540.24 miles in 24 hours.

Race Results

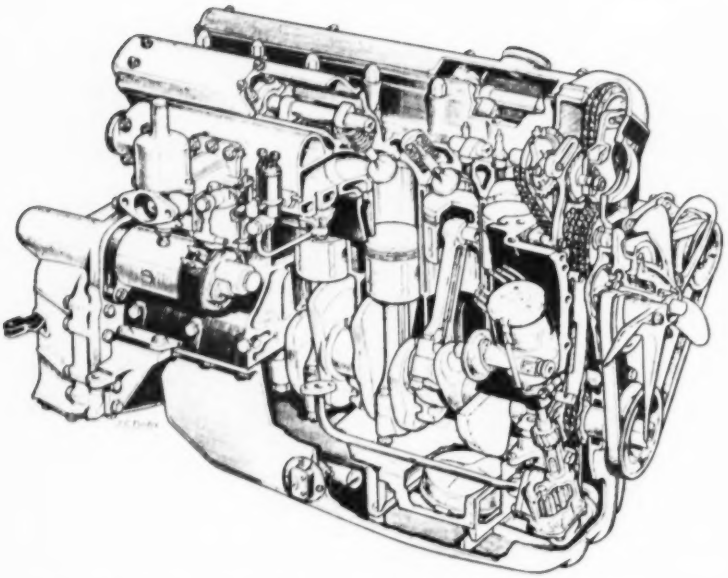
	Distance (miles)	Speed (mph)
1. Jaguar, 6 cyl 210 cu in....	2540.24	105.84
2. Jaguar, 6 cyl 210 cu in....	2511	104.62
3. Cunningham, Chrysler V-8 332.6 cu in.....	2498	104.08
4. Jaguar, 6 cyl 210 cu in....	2485.4	103.55
5. Ferrari, 12 cyl, 250 cu in....	2458.5	102.43
6. Gordini, 6 cyl, 150.8 cu in....	2451.25	102.13
7. Cunningham, Chrysler V-8, 332.6 cu in.	2427.4	101.14
8. Talbot, 6 cyl, 247 cu in.....	2337.7	97.40
9. Jaguar, 6 cyl 210 cu in.....	2282.17	95.09
10. Cunningham, Chrysler V-8, 332.6 cu in.	2251.3	93.80
11. Nash Healey, 6 cyl, 252.6 cu in.	2218.4	92.43
12. Austin Healey, 4 cyl, 162.4 cu in.	2151.5	89.64
13. Frazer Nash, 6 cyl, 122 cu in..	2118.2	88.25
14. Austin Healey, 4 cyl 162.4 cu in.	2101.2	87.55
15. Porsche, 4 cyl, 90.6 cu in.....	2070.3	86.26
16. Porsche, 4 cyl 90.6 cu in.....	2069.1	86.21
17. Panhard, D.B., 2 cyl, 45.4 cu in	1983.1	82.62
18. Osca, 4 cyl, 66.6 cu in.....	1943	80.95
19. Panhard D.B., 2 cyl 45.4 cu in.	1932.4	80.51
20. Panhard, 2 cyl, 51.9 cu in.....	1902.8	79.28
21. Panhard, 2 cyl 37.3 cu in.....	1869.4	77.89
22. Panhard, 2 cyl 51.9 cu in.....	1827.4	76.14
23. Renault, 4 cyl, 45.7 cu in.....	1825.2	76.05
24. Panhard-Monopole, 2 cyl, 37.3 cu in.	1772.4	73.85
25. Renault, 4 cyl 45.7 cu in.....	1532.5	63.85

By W. F. Bradley
Special European Correspondent for AUTOMOTIVE INDUSTRIES

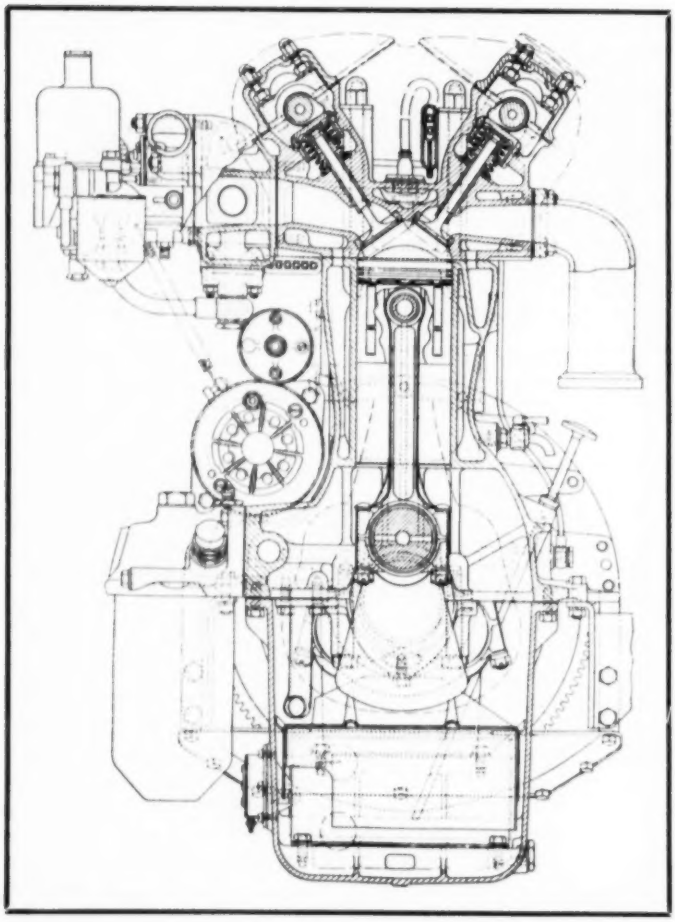
going from the 45.7 cu in. Renaults which never were designed for racing, to such cars as the Ferrari, Alfa-Romeo, Gordinis and Oscas, which had speed as the primary objective in their original design. The necessity of using commercial 90 octane gasoline, minimum distance of 235 miles before taking on water, oil and fuel; strict attention to body dimensions; electrical equipment which must remain effective all the time; the requirement that every spare part or tool must be carried on the car itself—all this has tended towards the development of a conventional type of automobile, as distinct from the racing machine.

Few European sports engines go beyond a piston displacement of 200 cu in. Talbot was the largest with 273.4 and the winning Jaguars had 210 cu in. Generally, European displacements remain below 200 cu in., compared with 332.6 for the Chrysler-engined Cunninghams. Obliged to use 90 octane gas, with a maximum addition of 0.5 per 1000 of lead, or a mixture of 75 per cent gasoline, 15 per cent alcohol and 10 per cent benzol, it was necessary to hold down compression ratios, the maximums being 9.5 for the small Renaults, 9.1 for Cunningham, 8.8 for Gordini, and 8.5 for Talbot. There was some reluctance to reveal maximum powers, for these were restricted by the use of commercial fuel, but Pegaso claimed 1.04 hp per cu in., Lancia 1.2, Jaguar 1.05, and Talbot 0.90.

All the tendency is towards hemispheric combustion chambers with two overhead camshafts, unless the sports models are developed from a valve-in-head pushrod engine. The most striking example of a car laid out for mass production and transformed for speed work is the 45.7 cu in. Renault. Normally run with a compression ratio of 7.2, this is increased by a special aluminum head and pistons to 9.5. Other changes are a stiffer crankshaft, light alloy rods, a special camshaft, dual carburetor, larger exhaust manifold, double capacity oil sump, bigger radiator, and four or five speed transmission in place of the three speed on the standard cars. All these changes are carried out by



Part-cutaway view of the Jaguar engine. Weber carburetors were used instead of the type shown.



Transverse section of the 210 cu in., six cyl Jaguar engine.

the Renault Co., individual owners going further with tubular chassis and special bodies.

Two types of frames dominate: girder construction small diameter steel tubes, or large diameter tubes. Light alloy tubes are being used in a few cases. In the braking section the feature is the good results obtained by Jaguar and Renault with the disk type. More brakes are being placed inboard and a lot of attention is being paid to ducting air to the drums.

Lancia produced a modified version of the narrow-angle V-six, the piston displacement of which had been reduced from 183 cu in. to 167.7 cu in. and a supercharger added. The object of this, according to engineer Yano, was the desire to obtain the necessary reliability for a 24-hour test, by dropping maximum revolutions from 7400 to 6200-6400, without any loss of power. Although a definite figure is withheld, output is understood to be slightly in excess of 200 hp. These light alloy V-sixes have four overhead camshafts, a four bearing crankshaft, dual ignition, and dry sump lubrication. The horizontal Roots-type blower is mounted in the angle formed by the two banks of cylinders, and is driven by a broad flat belt off the rear of the crankshaft. Compression ratio has been dropped to 6.1, while the pressure delivered by the blower is approximately five psi. There is a dual Weber carburetor at each end of the compressor with the inlets offset from the center line, one taking its air direct from the scoop on the hood, and the rear one receiving it through a pipe which reverses its direction.

Another outstanding Lancia feature is the use of inboard front wheel brakes. The chassis frame is a steel tube, welded girder type with a big diameter tubular axle carrying trailer arms which receive the base of the steering pivots, the head of the pivots being shackled to a transverse spring clamped to an upper cross frame member. The front brake drums are mounted inboard on the frame and connected to the road wheels by means of universal-jointed shafts. Brake cooling arrangements are elaborate, with a series of rectangular-section air scoops on the vertical face of the light-alloy drums, and between these scoops a series of holes of nearly ½-in. diameter directing air into the interior. Rear suspension is practically a duplication of that at the front, with an upper transverse spring

Three of the contestants swing wide before going into a turn. Car No. 16 was wrecked and its driver killed a few moments after this photo was taken. United Press photo by staff photographer Rene Henry.

clipped to a tubular cross frame member. This replaces coil springs used on stock cars. As on all present Lancia models, the clutch and five-speed transmission are rear mounted, with inboard brakes.

Using dry sump lubrication, Lancia places the oil cooler in the inside of the right rear fender, a scoop on the outside of the fender leading air around the cooler and discharging it around the tail light. In addition to hydraulic shock absorbers, Lancia made use of a friction set adjustable while running by means of a system of cables and pulleys controlled from a spoked wheel projecting through the center of the bulkhead back of the driver. The Lancia cars are all sedan models.

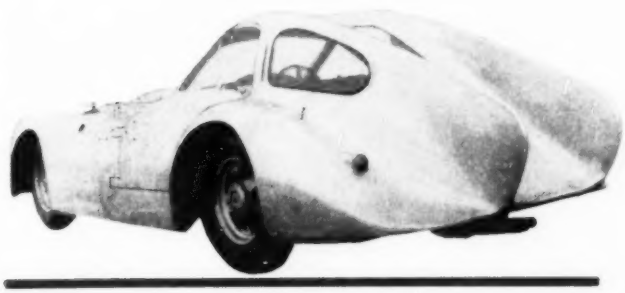
One of the Cunningham Specials (3) going into a turn during the race. United Press photo by staff photographer Rene Henry.

The only other supercharger use was by private owners. One of the six-cylinder Talbots was thus equipped, independently of the manufacturer, with a dual S.E.I. blower driven by five belts at the front, and giving a low boost. A somewhat similar fitting was seen on a stock Peugeot.

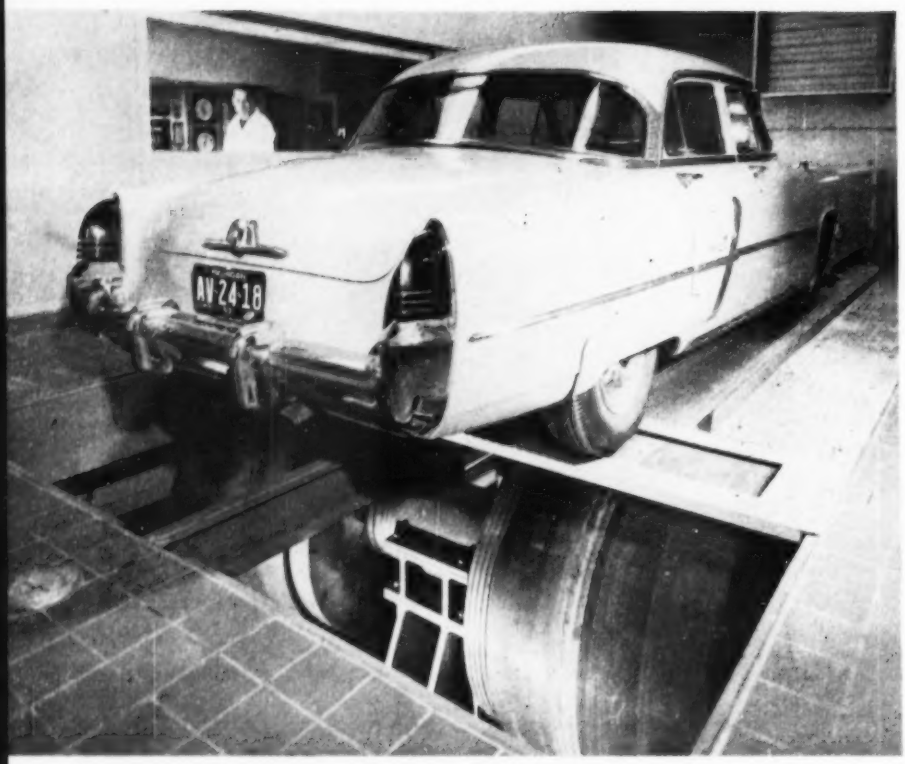
Alfa-Romeo produced a new type of six of 3.42 in. by 3.86 in. bore and stroke with overhead camshafts and a Weber carburetor per cylinder. This featured an entirely new rear end, with De Dion type axle, inboard brakes, coil springs, a triangular radius member and an anti-roll bar. The cars showed high speed, but were successively eliminated by reason of detail mechanical defects.

Cunningham claimed that by working on the Chrysler V-eight engines he had boosted output to 340 hp, which was the highest

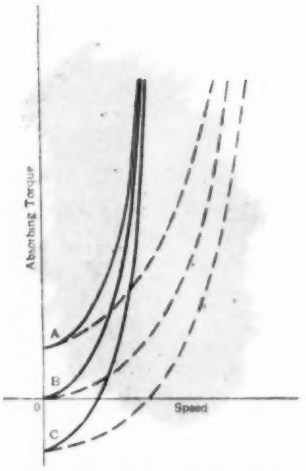
(*Turn to page* 104, *please*)



Dual stabilizing fins were a feature of the Bristol coupes, one of which is shown here.



Large drums just under floor level in chassis test cell are in contact with rear wheels of car. Drums are flexibly coupled to dynamometers. To vary inertia of the system to correspond with that of the car being tested, five inertia plates are provided with each drum.



Curves of torque proportional to speed squared. By using this characteristic, wind resistance can be simulated. Uphill and downhill travel can also be simulated by adding or subtracting a fixed value of torque corresponding to steepness of grade. (Curve A, uphill; curve C, downhill.) Dotted lines indicate that constants of the circuit can be varied to represent wind resistance against different sizes and configurations of cars.

Many Automotive Tests Facilitated

THE dynamometer is applied today in virtually every industry where rotating machinery is tested. It is used for testing prime movers such as waterwheels, steam engines, and internal-combustion engines; driven machines such as pumps, fans and blowers; and power converting or transmitting equipment such as gearing, transmissions, couplings, differentials, and belting. An accurate, reliable, and flexible device, the dynamometer has proved especially valuable in the automotive industries, where it enables a wide variety of laboratory tests under controlled conditions.

Typical Applications

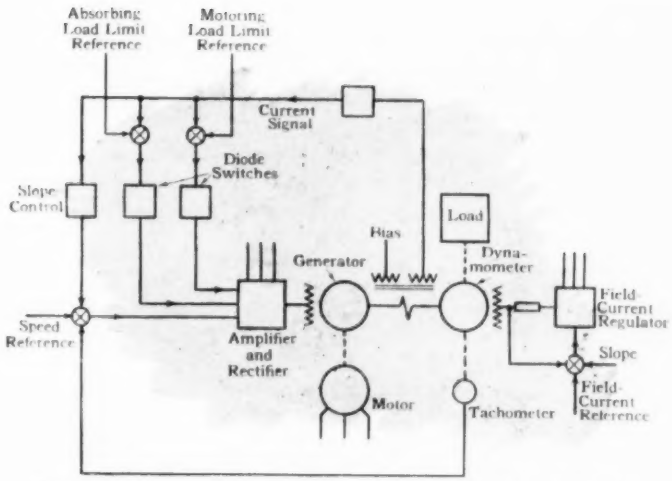
Although the device is by no means new to the industry, the modern dynamometer with its reliable, accurate and sensitive control has advanced the art of automotive testing tremendously. Also, the ability of the dynamometer and its associated equipment to simulate road conditions such as automobile inertia, wind resistance, and road grades has permitted moving automotive proving grounds indoors for many tests.

The advantages of laboratory testing of new or experimental designs is obvious. Laboratory tests can be conducted under controlled conditions, permitting tests to be performed always to the same reference or standard. Variables encountered in outdoor testing, such as temperature, wind, and rain, cannot affect indoor test results. The more accurate test results obtained enable test engineers to detect incremental improvements in design.

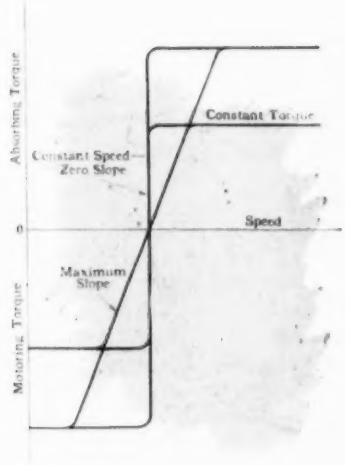
Another advantage of conducting tests under controlled conditions in a laboratory rather than on an outdoor proving ground is the saving in time. Identical conditions of previous tests can be reproduced at any time in the laboratory, while weather or road conditions may delay outdoor tests for days at a time.

Engine Testing

One of the most common uses of the dynamometer is the testing of internal combustion engines. In this test the speed-torque curve of the engine is obtained; also, data on such items as optimum spark setting, carburetor adjustment, and fuel consumption. Various



Block diagram of dynamometer control scheme using electronic regulators.



Curves showing constant torque and "slope" characteristics possible with dynamometer. Constant torque characteristic is used for governor testing, the "slope" characteristic can be used for any test where desirable to have speed drop with load when dynamometer is motoring, or increase with load when dynamometer is absorbing.

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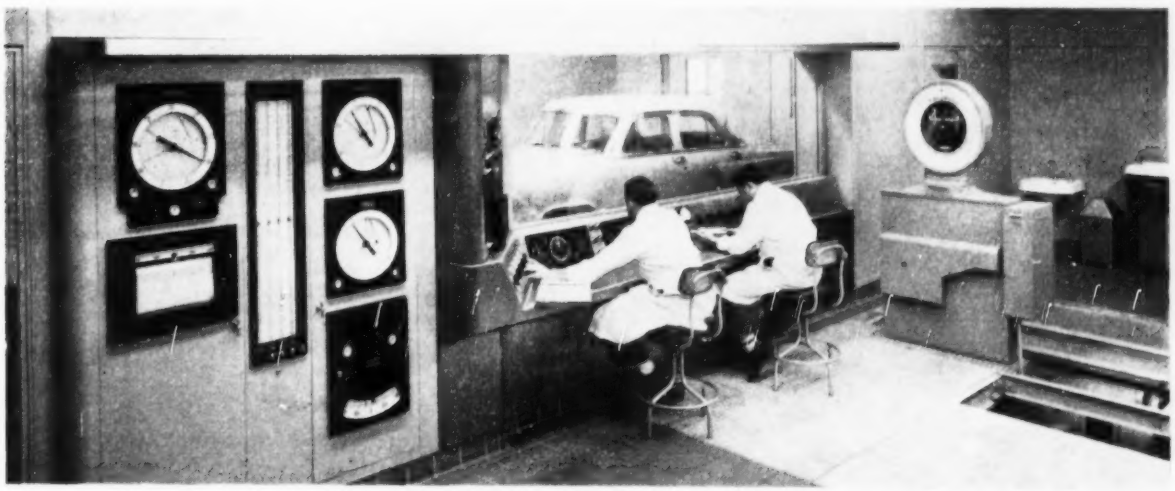
WESTINGHOUSE ELECTRIC CORP.

by Dynamometers

engine variables, such as water, oil and carburetor temperatures, oil and exhaust pressures, are held at a fixed value during these tests. These tests are performed with the constant-speed characteristic of the dynamometer. The dynamometer is started and brought up to some low speed with the speed control. Under these conditions, the dynamometer is motoring as it cranks the engine. When the fuel and ignition are turned on, the dynamometer becomes a generator and absorbs the engine power. After all data are taken at full throttle the fuel and ignition are cut off, causing the dynamometer to motor but at the same speed as under full throttle. The torque reading then is the



Test engineers at control desk look through duplex plate glass window to chassis test cell where Lincoln Capri is being tested. The window permits good vision but practically isolates sound.

frictional torque at that speed. The speed is then increased with the speed control and the test repeated.

Governor Testing

When the characteristics of an engine governor are desired, the dynamometer is operated with its constant-torque characteristic, since the speed of the engine is fixed by the governor. In this test the speed control is set at some low value. When the maximum absorbing load-limit is reduced to a value below the maximum torque available from the engine, the engine accelerates with constant torque until the governor limits the speed; it then remains at that speed and torque. As the maximum absorbing load-limit is changed, the torque changes, while the speed is determined by the governor. The load can be changed from maximum engine torque to zero torque, giving the complete behavior of the governor under various load conditions. It is also possible to change the engine torque from maximum to zero in a single switching operation to simulate a mechanical failure such as a broken shaft. By repeating this test with various governor settings, a family of curves is obtained giving governor performance at various speeds.

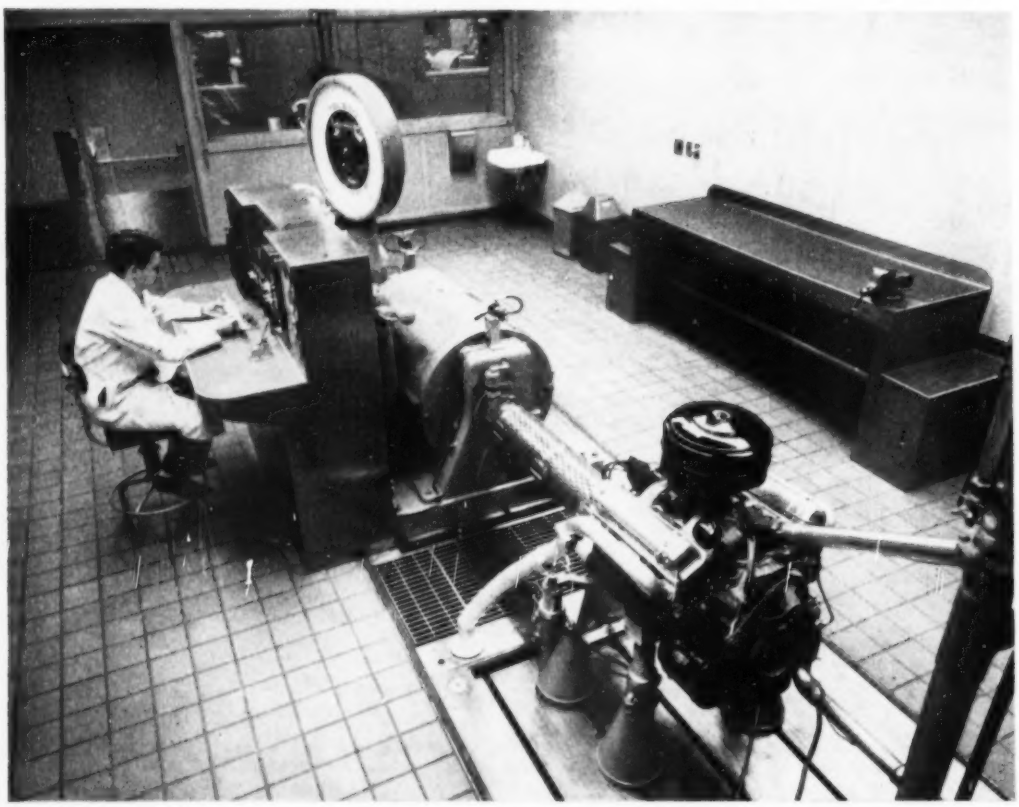
Transmission Testing

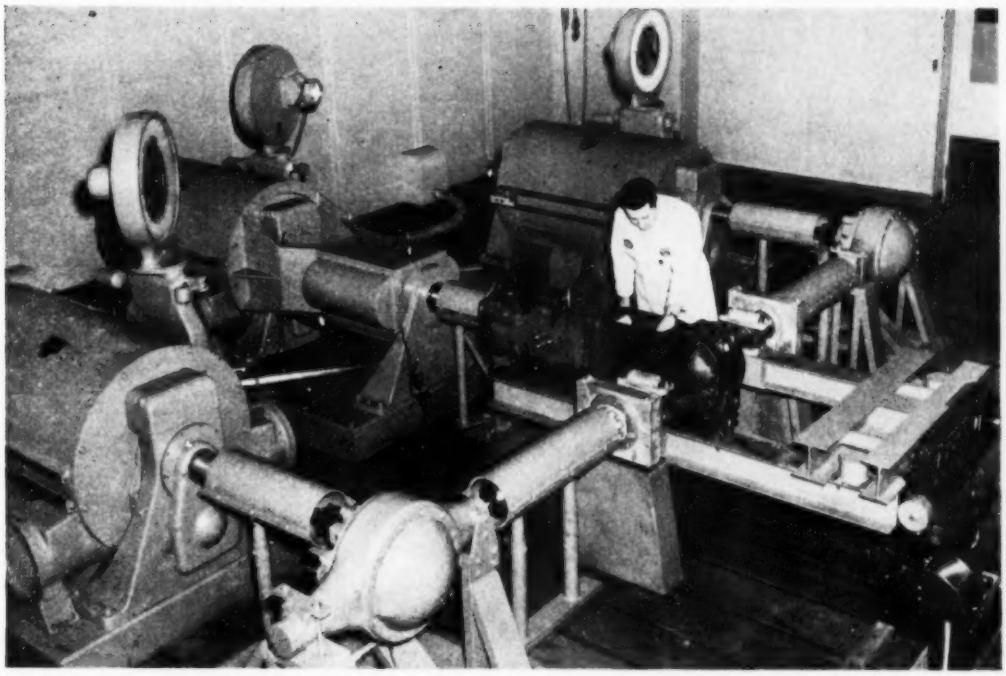
In testing transmissions, the information required includes wear under specified speeds and loads, efficiency, and life. For automatic transmissions additional information such as output speed, torque and slippage under various load conditions is important. For this test two dynamometers are used, one for input and the other for output. The input dynamometer is operated with a constant-speed characteristic, while the output dynamometer fixes the load by operating with a constant-torque characteristic. In testing the transmission characteristic of automatic transmissions, the input speed is fixed, and the output torque is increased until the input torque corresponds to the maximum engine torque developed at that speed. The acceleration characteristic of the transmission can also be determined by coupling a calibrated inertia tc the output of the transmission.

Axle Testing

Information usually desired in testing axles includes such items as wear under various speeds and loads, efficiency, life, and deflections of the various members. This test requires three dynamometers, one input and

Engine test cell in Ford Motor Company's new laboratory. Dynamometers are rated at 200 hp absorbing, 150 hp motoring through a speed range from 2500 to 6000 rpm. Desk mounted next to dynamometers has electrical control in center. Remainder of desk is used to control and indicate performance of the engine.





Axle test cell at Ford Motor Company's new laboratory. One input and two output dynamometers are used. The input dynamometer on the drive shaft is rated at 400 hp absorbing, and 300 hp motoring through a speed range of 1500 to 4000 rpm. The output dynamometers are rated at 150 hp absorbing, 120 hp motoring through a speed range of 400 to 1600 rpm.

two output. The input dynamometer operates at constant speed while the two output dynamometers operate at constant load. By adjusting the loads on the output shafts, and the speed of the input shaft, a variety of output speeds and loads can be obtained for testing wear, life, and other factors. By setting the speed to a very low value, and loading the output, the deflections in the various elements of the axle assembly can be measured from no load to the rated load of the axle.

Chassis Testing

Chassis testing is the testing of a complete automobile. This test is designed to collect data in a laboratory where road testing was previously required. The dynamometer in this case is coupled to two large drums that are in contact with the rear wheels of the car. The inertia of the rotating system can be adjusted to correspond to the inertia of the car under test by means of several special plates that can be bolted to the drums when needed. The front of the car is supplied with a flow of air to provide cooling corresponding to the motion of a car at a given speed. With this arrangement, the overall performance of the car can be obtained by conducting a test similar to the engine test. For acceleration testing, a load in addition to the car inertia must be included; this corresponds to the wind resistance. To simulate this, the torque proportional to speed squared characteristic of the dynamometer is used. To simulate a car accelerating up a hill, the speed-torque curve is displaced by a fixed amount corresponding to the steepness of the hill. If downhill acceleration is desired, the speed-torque curve is displaced in the opposite direction.

These examples of dynamometer application in automobile laboratories are but a fraction of the applications for which the device is used in industry. Its use enables precise results, which in turn can be translated into new and improved machines, as well as providing an accurate picture of present designs.

• • •

Upgrade Engineers

Without minimizing the actual and potential shortage of engineers for industry, Ralph L. Wilson, president, American Society for Metals and director of metallurgy for Timken Roller Bearing Co., told a group of technical teachers, industrialists and other scientists last month that the emphasis on "engineers" should be shifted to emphasis on "engineering."

The occasion was the first organized teachers' course in metals technology and other technologies at the vocational or high school level, at New York State Teachers College. While it is not possible to fill the present shortage of 40,000 engineers, Mr. Wilson pointed out, with the training of technicians such as will be enrolled next fall for special training, the shortage will automatically be reduced through the release of engineers for top engineering jobs.

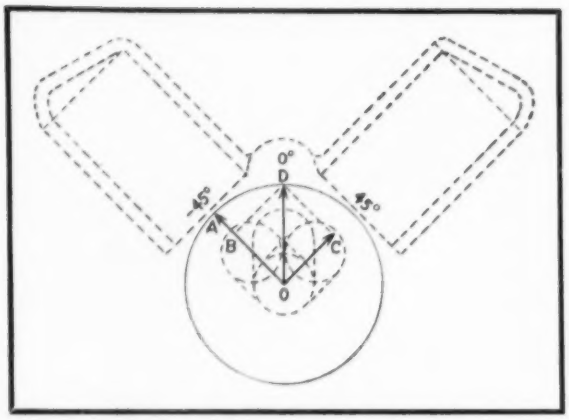


Fig. 1—Diagram of primary inertia forces in a two-cyl 90-deg V engine.

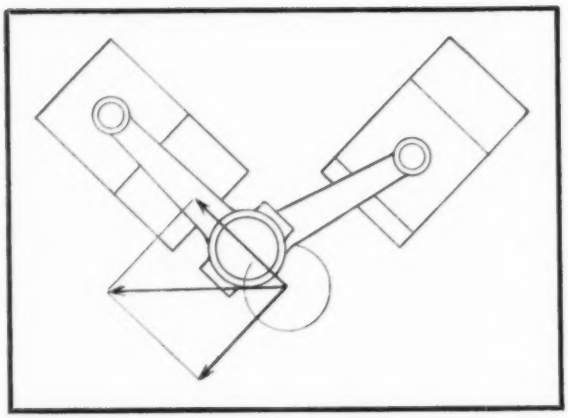


Fig. 2—Diagram of secondary inertia forces in a two-cyl V engine.

An Evaluation of the 90 Deg. V-Six Engine

UNDOUBTEDLY the most pronounced trend in passenger-car engineering during the past two years has been the switch from eight-cylinder in-line to V-eight engines The chief reason for this change is generally said to be that it permits of more rigid construction of the powerplant without increase in weight, which in turn permits of higher operating speeds and higher specific outputs without the risk of running into trouble from roughness and torsional vibration. But a gain of equal importance would seem to be that the reduction in engine length makes possible a shorter wheelbase for given passenger accommodations or more roomy bodies for a given wheelbase.

While in the field of large cars, those generally equipped with eight-cylinder engines, the trend is still toward larger engine outputs, an opposite tendency is noticeable in connection with smaller cars. These latter, which generally carry six-cylinder engines, show higher fuel mileages and are easier to park. That these features have an appeal to American motorists is indicated by the considerable sales volume of foreign midget cars in this country, and also by the increase in the number of models of smaller horsepower and shorter wheelbase than the "Big Three" that are being offered by American manufacturers.

The sponsors of these smaller cars undoubtedly also would welcome an opportunity to shorten their powerplants by changing from the in-line to the V-type of engine, but, as is generally known, the V-six has certain undesirable features which it is difficult, if not impossible, to get rid of entirely. To obtain the rather desirable feature of equal spacing of power impulses with a three-throw crankshaft, the two banks of cylinders would have to be placed at an angle of 120 deg, and that would lead to an engine which it would be difficult to accommodate under the hood, especially with valves in the head, which is now the preferred position for them. With a six-throw, 60-deg crankshaft equal spacings of power impulses can be obtained with a 60 deg angle of V, but if a six-throw crankshaft is used the reduction in the overall length of the engine, as compared with a six in-line, is not very important. Besides, production costs of a six-throw, 60-deg crankshaft would be materially higher than those of a three-throw 120-deg shaft. With any other angle of V the power impulses would be spaced unequally, and no matter what the crank arrangement, there would be at least one rocking couple. As regards the principal advantage of the type, a V-six with three-throw crankshaft would measure only about 56 per cent the length, over the cylinder block, of an in-line six of the same bore, assuming the two cylinder banks to be slightly offset. The overall length of the engine

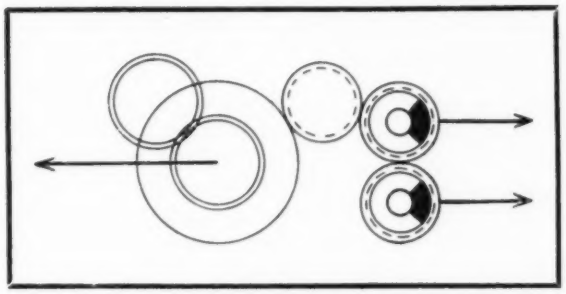


Fig. 3—Arrangement of rocking-couple neutralizing mechanism at forward end of a six-cyl 90-deg V engine.

By P. M. Heldt

(front of fan to rear of flywheel housing) would be roughly two-thirds that of the in-line engine. As a six-cylinder in-line engine of 3⅝-in. bore measures approximately 40 in. overall, a V-six would permit of a saving in chassis length of more than 13 in.

The subject of V-sixes was discussed by this writer in an article which appeared in AUTOMOTIVE INDUSTRIES for August 15, 1948. In view of the fact that smaller, shorter cars seem to be in the offing, and that several experimental departments are said to be developing V-sixes, it may stand re-examination. In the previous article the 90-deg V-six was rather summarily dismissed, because with it the power impulses are spaced unequally, 90 and 150 deg. That, of course, is a disadvantage, because for equal uniformity of torque a flywheel of larger capacity is needed. The uneven sequence of the exhaust beats would hardly cause any discomfort, for at low speeds the exhaust is completely muffled, and at high speeds it is drowned out by other noises. Uneven spacings of power impulses have rarely been used in automobile engines. The Lincoln L-head, V-eight automobile engine had its cylinder blocks arranged at an angle of 60 deg rather than 90 deg, and some 12 cyl engines were made with a 50, 55, or 65 deg angle between the banks instead of 60 deg. In the railroad field, on the other hand, unevenly spaced power impulses are a common feature.

From the standpoint of mechanical balance the 90-deg V seems to be the most practical of all V sixes. It consists essentially of two three-cylinder in-line engines, the pistons of both of which act on the same three-throw, 120-deg crankshaft. In the three-cylinder engine there is no unbalanced inertia force or shaking force, and as there is no shaking force in either of the two cylinder banks, there is none in the combination of the two, the six-cylinder engine. On the other hand, each bank of three cylinders produces both a primary and a secondary rocking couple. With an

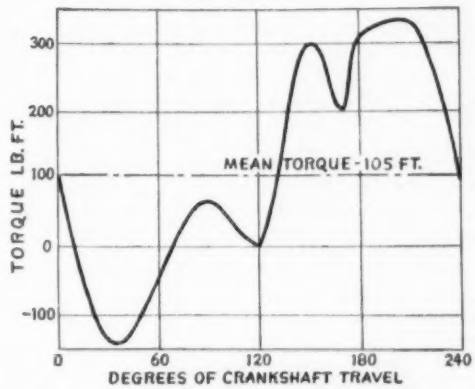


Fig. 4—Torque or crank-moment diagram of a three-cyl in-line engine.

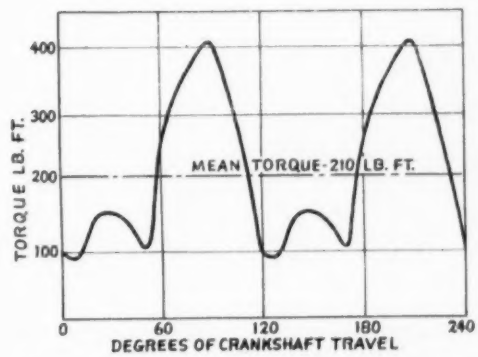


Fig. 5—Torque or crank-moment diagram of a six-cyl in-line engine.

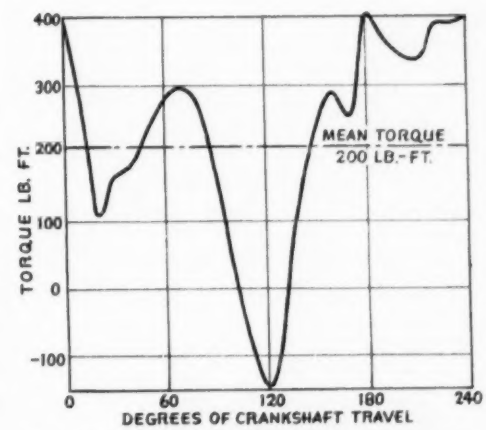


Fig. 6—Torque or crank-moment diagram of a six-cyl 90-deg V engine.

angle of 90 deg between the two banks, the primary rocking couple can be eliminated by means of additional balance weights on the crankshaft. These balance weights, of course, can be combined with those required to balance rotating parts, such as the crank arms, crankpin, and connecting-rod big end.

Primary Inertia Force

In any one cylinder the primary inertia force always acts in the direction of the cylinder axis. It is at its maximum value in the upward or outward direction when the piston is at the top end, and at its maximum value in the downward or inward direction when the piston is at the bottom end of the stroke. In Fig. 1 we assume two cylinders to each make an angle of 45 deg with the vertical, and their pistons to be connected to a common crank. We will call the crank angle zero when the crank extends vertically upward, and assume the crank to turn right-handedly. With the crank at minus 45 deg it is in line with the left cylinder. The piston of that cylinder then is at the top end of the stroke, and the primary inertia force, which we may represent by OA, is at its maximum and directed outwardly along the cylinder axis. At the same time the piston in the right-hand cylinder is near mid-stroke, and the primary inertia force on it is then zero. Consequently, with the crank in this position the entire primary inertia force of the two-cylinder engine is represented by OA, and is directed outward along the axis of the left-hand cylinder; that is, it is in line with the crank radius.

Now assume the crank to have turned through an angle of 45 deg in the clockwise direction, to 0 deg. The primary inertia force in the left-hand cylinder now has decreased to 70.7 per cent its maximum value, and is represented by OB. In the right-hand cylinder the force has increased from zero to OC, the same value it now has in the left-hand cylinder, and OB and OC combined have a resultant OD, which is of the same magnitude as OA and therefore equal to the maximum. The resultant again is in line with the crank radius. These same relationships hold throughout a complete revolution of the crank; that is, the resultant of the primary inertia forces in the two cylinders has a constant value and is always in line with the crank. It can therefore be balanced by the centrifugal force on a counterweight opposite the crank.

Primary Rocking Couple

The primary rocking couple in a three-cylinder in-line engine results from inertia forces on reciprocating parts in the individual cylinders, which are out of phase. When the primary inertia force in the forward cylinder is at its maximum in one direction, the primary inertia forces in the other two cylinders are at one-half their maximum value and in the opposite direction. Oppositely directed forces at or near opposite ends of a beam or its equivalent produce a couple, and in this case, as all of the forces change direction, they produce a rocking couple. Now, it is obvious that if the primary force on reciprocating parts in each cylinder is neutralized by the centrifugal forces on balance weights, as explained in the preceding paragrapn, there will be no primary rocking couple. That leaves only the secondary rocking couple to be considered.

Secondary Inertia Force

Like the primary inertia force, the secondary in each cylinder is at its maximum and directed outwardly along the cylinder axis when the piston is at the top of the stroke. But the secondary has twice the frequency of the primary, and whereas the primary changes from maximum upward to zero in 90 deg of crank travel, the secondary changes from maximum upward to maximum downward during the same crank travel. In Fig. 2 the crank is shown in the top-center position with respect to the left-hand cylinder, and the arrow extending from the crankshaft axis along the axis of the left-hand cylinder represents the secondary inertia force in the left-hand cylinder for that crank position. Since there is an angle of 90 deg between the two cylinders, the secondary inertia force in the right-hand cylinder lags 180 deg behind that in the left-hand cylinder; that is, it also is at its maximum value, but directed downwardly along the cylinder axis, as shown by the arrow in Fig. 2. The secondary forces in the two cylinders combine to produce a horizontal or transverse force, and the horizontal arrow in Fig. 2 represents the maximum value of the secondary shaking force in a *two-cylinder* 90-deg V engine. The vertical components of the secondary forces in the two cylinders cancel out.

As the crank turns right-handedly from the position in which it is shown in Fig. 2, the secondary forces in both cylinders decrease at the same rate, hence the two always remain equal numerically, and their resultant remains horizontal.

Now consider the two cylinders shown in Fig. 2 to be the two forward cylinders of a V-six. The horizontal shaking force of these two cylinders tends to move the forward end of the engine toward the left when the crank is in the position in which it is shown, and the corresponding forces in the remaining four cylinders tend to move the rear end of the engine toward the right. After the crank has turned through an angle of 90 deg the direction of the couple is reversed, the front end of the engine then moving (or tending to move) toward the right, and the rear end toward the left.

Secondary Rocking Couple

The maximum value of the secondary rocking couple in a three-cylinder in-line engine with 120-deg crankshaft is given by the expressiion $\sqrt{3}\ a\ y\ C$ lb-in., where a is the distance between cylinder axes; y, the ratio of crank radius to connecting-rod center-to-center length, and C, the centrifugal force in lb produced if the reciprocating mass of one cylinder is revolved at crank radius with crankshaft speed. Since the resultant rocking couple of the two banks is equal to $\sqrt{2}$ times that of the individual bank, the maximum value of the horizontal secondary rocking couple in a 90-deg V-six is $\sqrt{6}\ a\ y\ C$ lb-in.

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Unique Balancing for 60-Deg. V-Six Engine

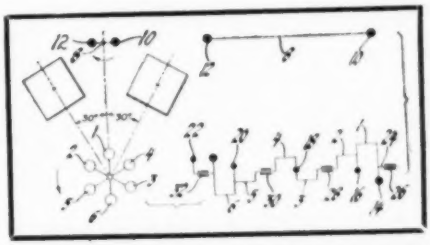

Fig. 1—This schematic sketch shows arrangement of crankpins and counterweights. Also shown are the phase and direction of the dynamic balance shaft.

A 60-DEG. V-six engine which is said to have a very low magnitude of overall unbalance has been patented recently, and the patent has been assigned to General Motors Corp. Among the other advantages claimed are high engine rigidity and a crankshaft of high torsional rigidity.

An object of the design is to produce a V-six engine in which the cylinders fire in sequence either from front to back or from back to front. With this arrangement, in a four-stroke engine, cylinders of either bank will have intake strokes 240 deg displaced from each other. By using a separate intake manifold on each block, together with a dual-type carburetor, excellent volumetric efficiency will be obtained.

The four-bearing crankshaft has three pairs of 60 deg displaced crankpins, each pair displaced 120 deg from the other two pairs. Crankpins adjacent to opposite ends of No. 2 and No. 3 main bearing are disposed substantially 180 deg from each other.

Longitudinal location and radial spacing of the crankpins, and arrangement of the counterweights, are shown in Fig. 1. Counterweight 16 is of such mass and so located as to substantially balance the forces set up by crankpins 1 and 2, and the rotating masses attached to them. Counterweight 18 balances the rotating masses associated with crankpins 3 and 4. The same applies to counterweight 20 and the masses at crankpins 5 and 6.

Each counterweight is located 150 deg from the crankpin on each side of it, and the three counterweights are displaced 120 deg from each other. This method of balancing helps to neutralize the unbalance forces to reduce main bearing load, but leaves an unbalance primary couple which is removed by the counterweights 14 and 22. The center of mass of counterweight 22 has the same angular displacement as the center line of crankpin 1; the weight 14 is located in the same plane but is displaced 180 deg. The counterweight without a number in Fig. 1 is an optional location for counterweight 22. By proper selection and placement of these weights, the engine is placed in primary balance with regard to both primary forces and primary couples.

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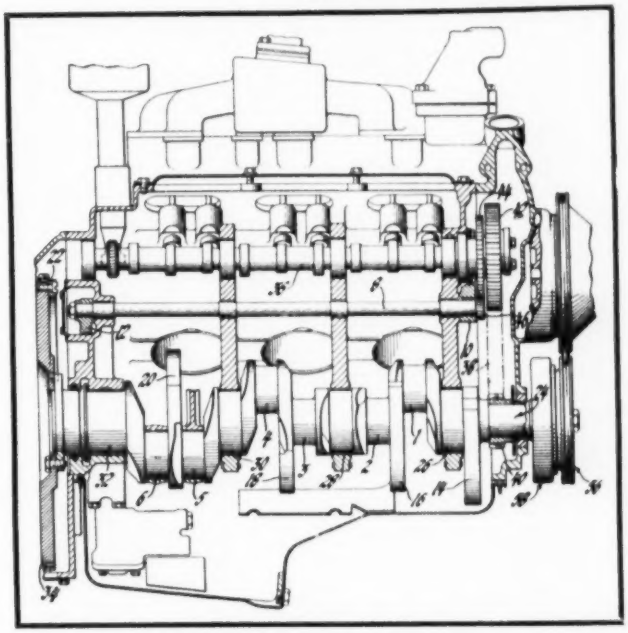

Fig. 2—Longitudinal section of the 60-deg. V-six engine.

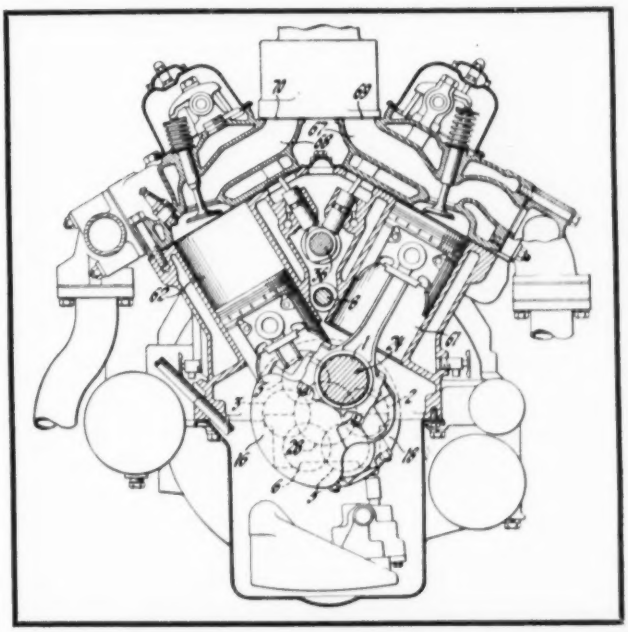

Fig. 3—Transverse section of the engine.

Tremendous Demand for Power Steering and Automatic Transmissions

By Joseph Geschelin

ASIDE from engine developments which have gripped attention in recent years, there is intense activity in the field of automatic transmissions and power steering for passenger cars. Power steering, in particular, has excited the imagination because of its spectacular rise in a period of but two years, and the widespread adoption it has enjoyed.

Automatic transmissions have taken longer to become established although in recent years the rise in demand has been so striking as to command respect. Moreover, there are many improvements in the offing as well as the likelihood that this feature will dominate the scene from now on. One of the latest developments in this connection is the announcement of a new fully automatic transmission by Chrysler, now in production and being installed in Chrysler Crown Imperials. Of torque converter type, this drive is said to have many advanced features. Its introduction marks the elimination of the conventional clutch pedal and clutch in Chrysler cars.

Although the adoption of these extra cost equipment items has been exciting, only the availability of authentic statistical data can give the industry the real facts in terms of car production. Up to now it has been necessary to rely upon estimates and educated guesses. The object of this study is to present the factual picture as gained from a personal survey among the passenger car producers.

Table 1, reproduced here, shows the current compilation of intensity of use of these devices on all makes of cars. It must be noted that figures for the first six months of 1953 are estimated, in the main.

As indicated, the figures on power steering are incomplete for some good reasons. In the first place, some makes have not yet adopted this device, while others began making installations only recently. In several instances the manufacturers have not reported. Nevertheless, the available data are presented for what they are worth.

Special attention is drawn to the reporting of figures on automatic transmissions for the first six months of 1953. Generally speaking, it would be wise not to make telling comparisons with 1952 percentages until returns are in for the entire year. This is due to a complex of factors. Although it is a foregone conclusion that the use of automatic transmissions is on the increase, the lower figures for 1953, where they occur in several instances, result from delays in delivery of drives rather than lack of interest on the part of buyers.

In the case of Dodge, the apparent decrease in the installation of automatic transmission is due to an entirely different circumstance. It so happens that for 1953, Dodge offers a variety of transmission

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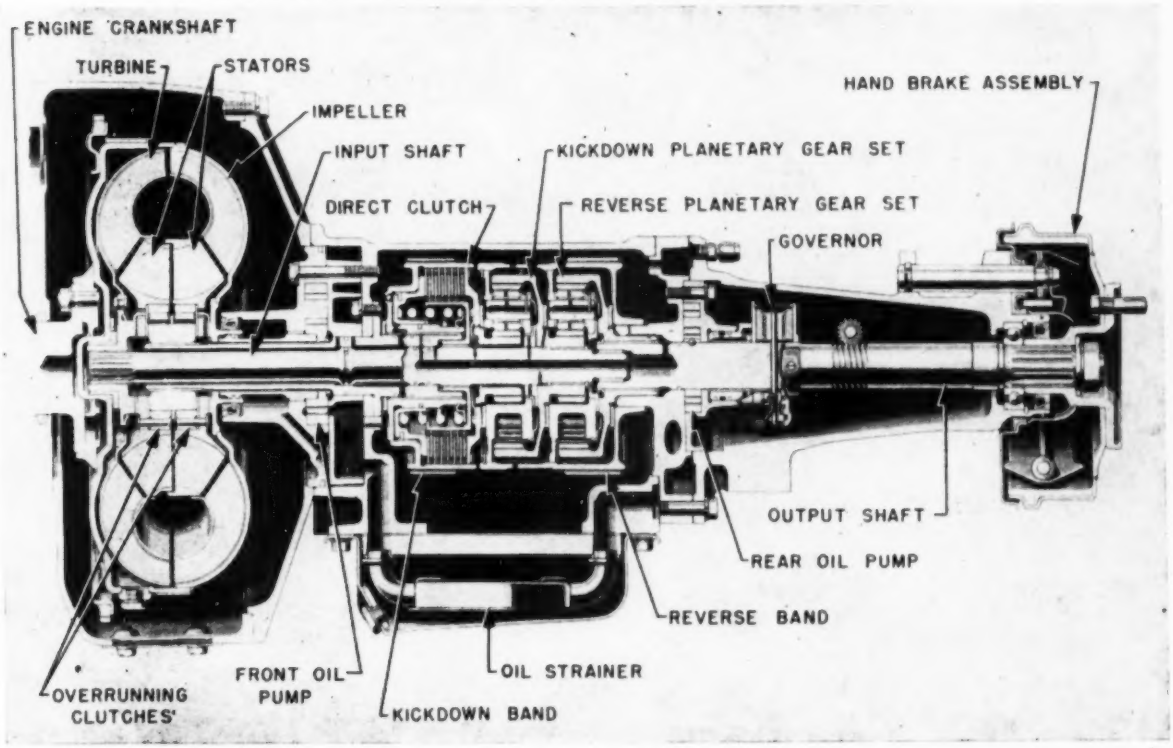
Automatic Transmissions and Power Steering in Percentages of Car Production by Makes

CAR MAKE	Automatic Transmission		Power Steering	
	1952	1953[1] (1st 6 mo.)	1952	1953[1] (1st 6 mo.)
Buick Roadmaster	100	100	54.2	100
Super	96.4	98.6	....	22.2
Special	61.5	51.5	....	3.5
Cadillac	99	100	.....	.....
Chevrolet	40	40	.....	.....
Chrysler	99.5	98.4	45.3	40.9
De Soto	98	97	33	48
Dodge	60.9	55.3[5]	.....	.....
Ford	33	30	.....	.....
Hudson	60.7	58.7	.....	.....
Kaiser	58.6	73.6	.....	.....
Lincoln	100	100	50[4]	64.6
Mercury	48.4	47.9	.....	.....
Nash	31.7[2]	33[3]	.....	.....
Oldsmobile	97	99	12	45
Packard	72.9	83.1	.....	21
Pontiac	82.1	85.7	.....	11.9
Studebaker	22	41	.....	.....

1—Estimated for 1st 6 months.
2—Ambassador and Statesman.
3—All Series.
4—For two months only.
5—Decrease due to increased transmission options.

CHRYSLER POWERFLITE AUTOMATIC TRANSMISSION



This sectional view shows details of Chrysler's new automatic drive which is now in production for the Imperial line. A complete description of this new transmission and torque converter will appear in an early issue of Automotive Industries.

• • •

BRASS RADIATORS WITH ALUMINUM FINS

ALTHOUGH the hue and cry of a copper shortage has died down, much to the relief of the industry in general as well as to radiator producers, it is of real interest to learn that McCord Corp., Detroit, Mich., has been carrying on an experimental project which has demonstrated the feasibility of producing radiators of conventional brass tube and header sheet construction but with fins of aluminum. It must be emphasized that this is purely an experimental project designed as a service to McCord's customers and to the industry. As a matter of fact, experimental core installations have been in use for a year or more with excellent results to date.

Looking at the realities of the situation, McCord has decided that even in the event of a copper shortage, the safest course would be to continue, if possible, the use of time-tried materials for all parts of the radiator in contact with the cooling fluid. Consequently, only the fin section is made of aluminum in these experimental cores. In the event of a copper shortage in the future, the use of aluminum for fins alone could eliminate from eight to 10 lb of copper per radiator on the average.

McCord's technique is to solder the aluminum fins to the copper or brass tubes, using a high zinc solder containing tin. Secret of the success of the process, however, is the use of a special proprietary flux which was developed by the company and is covered by patents. With proper use of a specific flux the soldered joint is developed perfectly and, in effect, provides an alloy bond between the two dissimilar metals. Moreover, there is no acid residue resulting from the process, hence no pickling or cleaning is required except for a water rinse.

Since the special flux composition developed for this application might not be employed in aluminum-fin radiator manufacture unless there is a copper shortage at some time, McCord has investigated other useful production applications where the flux may be of value to large manufacturers. One of these is the soldering of copper and aluminum terminals to aluminum conductors as in the case of battery cables. There is a gamut of applications in mass production where aluminum must be joined to copper and many of these can be handled most effectively with the McCord flux, according to our information.

In any event, the company has shown these developments to a number of customers and other mass producers and is prepared to supply the special flux on a license basis.

It may be noted in passing that McCord does not anticipate that aluminum radiators or composite radiators will be used except on a limited experimental scale in 1954. Their use in the future will depend largely on their ability to equal the performance of conventional radiators at competitive costs. The consensus appears to be that while copper is readily available, and while the present price structure is maintained, copper and brass remain the best radiator core materials from the standpoint of serviceability, cost, and fabrication.

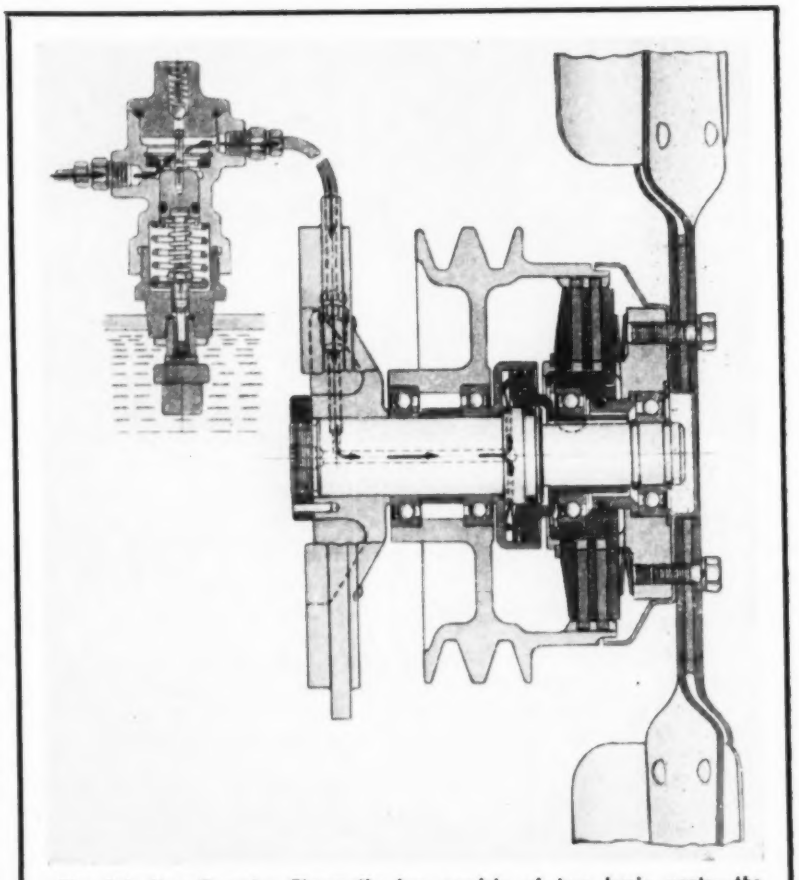
New Drive for Radiator Fan

Is Thermostatically Controlled

To maintain coolant temperatures in heavy-duty engines at an efficient operating range, Schwitzer-Cummins has designed and built a fan drive that is thermostatically controlled. The drive utilizes a built-in multiple disk clutch, normally engaged by spring pressure, turning the fan with the pulley. When cooling air is not required, hydraulic or pneumatic pressure, regulated by a special thermostatic control valve, automatically disengages the fan.

Called the Thermatic fan drive, the unit permits an increase in available engine horsepower up to 10 per cent when the fan is disengaged from the engine. According to Schwitzer-Cummins engineers, fuel savings up to 10 per cent are claimed to be obtainable when using the thermostatically controlled fan. Another feature of the drive is that it permits more rapid engine warm-up.

Two major sub-assemblies—the pulley hub assembly and the fan hub assembly—make up the basic fan drive. Each of these is mounted on its own bearings. The fan hub assembly, which is inserted into the pulley hub, includes the clutch.



The Schwitzer-Cummins Thermatic fan consists of two basic parts—the drive section and the control valve unit. Either air or oil pressure may be used to actuate the multiple disk clutch in the fan drive.

Splined internally, the pulley hub is in constant engagement with the externally splined friction disks of the clutch. In locked up position they engage the steel friction plates, which in turn drive the fan hub through their tongues projecting into the slotted, extended portion of this hub.

Two Belleville springs—dished washer type—keep the clutch normally in locked up position, as shown in the illustration. When the proper hydraulic or pneumatic pressure is introduced through the hollow shaft into the cylinder, it reacts upon the piston, which through the release collar forces the front pressure plate to depress the two springs, releasing the clutch.

The control valve, which operates the drive mechanism at predetermined temperatures of the engine coolant, utilizes air at 72 psi or oil at 30 psi for operation. Air is used when the vehicle is equipped with an air compressor and air storage tank. Where the use of oil pressure from the engine's oil system is used to actuate the clutch, a larger size piston is used in the system to compensate for the lower pressure available. The thermal element of the control must be in contact with the engine coolant at all times and may be

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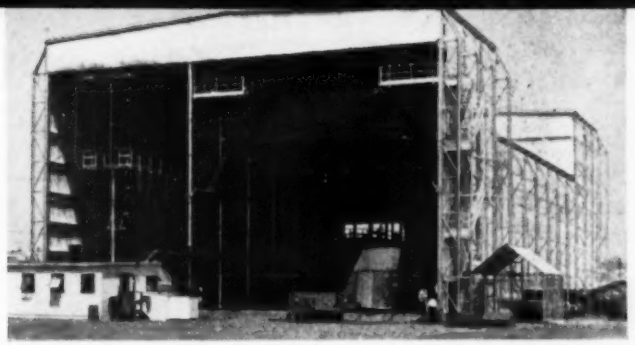
Flying Boats Tested in Huge Steel Dock



Open-end view of Convair's new test facility in operation at the company's San Diego division. Siding on the steel structure is plastiglass.

CONSTRUCTED especially for testing structural features of Navy flying boats, a $369,000 static test facility is now in operation at the San Diego division of Consolidated Vultee Aircraft Corp. This steel dock is said to be the largest fixture of its kind in the aircraft industry.

The test structure is built on a three-ft concrete foundation, 100 by 196 ft. The heavy slab is designed with tracks which can resist a load of 15,000 lb per ft.

Steel columns support large steel trusses which are used to apply loads to seaplane wings, hulls, and various components. Maximum height of the structure is 67 ft, with ceiling heights of 56 ft in one bay and 35 ft in another.

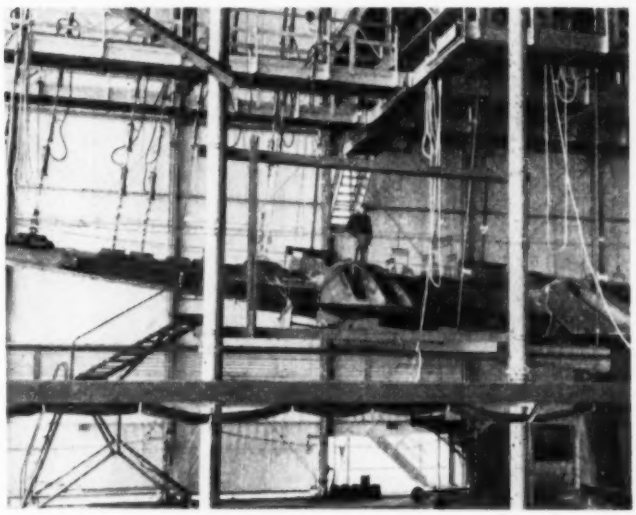
The structure is enclosed with plastiglass siding for weather protection. Test recording equipment is installed in a separate building which also has office space for engineering personnel.

Components placed in the huge fixture will be destroyed during tests in order to ascertain ultimate strength characteristics. This destruction is necessary to prove the structure and safety of new planes.

In Convair's new test facility, various types of loads can be applied by hydraulic jacks on an airplane. The equipment can simulate many flight conditions such as rolling-pullout, positive low angle of attack, symmetrical hull landing, and dynamic handling. Equipment can apply loads ranging from 60,000 to 1,000,000 lb from any direction, and can divide any one load into as many as 200 application points.

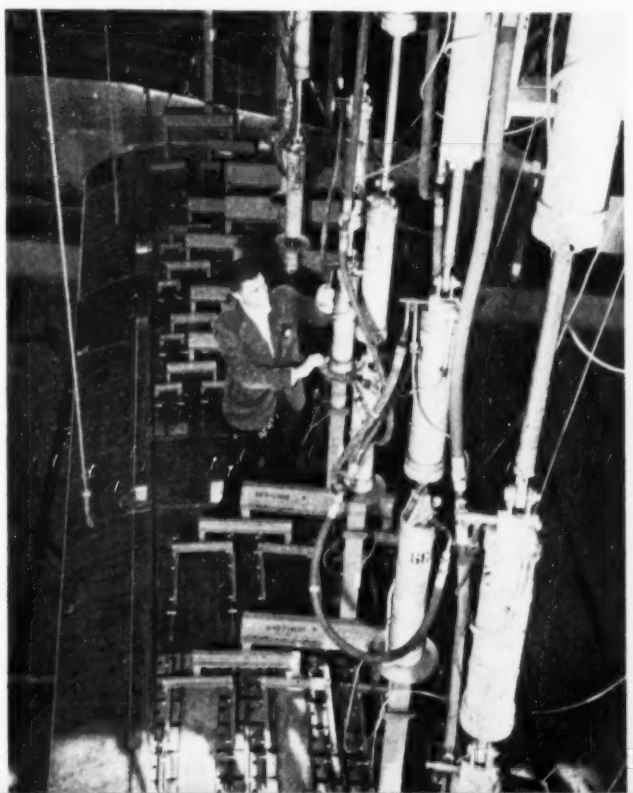
On the R3Y wing recently tested, 3000 sponge rubber pads, five in. by five in., were glued to the wing surface. These pads, plus a "whiffletree" arrangement which distributes the load applied by hydraulic rams, make it possible to duplicate accurately every flying or landing condition load that an airplane is likely to encounter.

For some tests, strain gages are glued to the airplane structure. An electronic unit automatically plots data furnished by the gages.



A wing being tested under load. Catwalks above facilitate access to test apparatus. Below are hydraulic lines and hundreds of wires connected to strain gages.

This illustration shows how hydraulic loading jacks are attached through whiffletrees and tension pads to a wing surface.



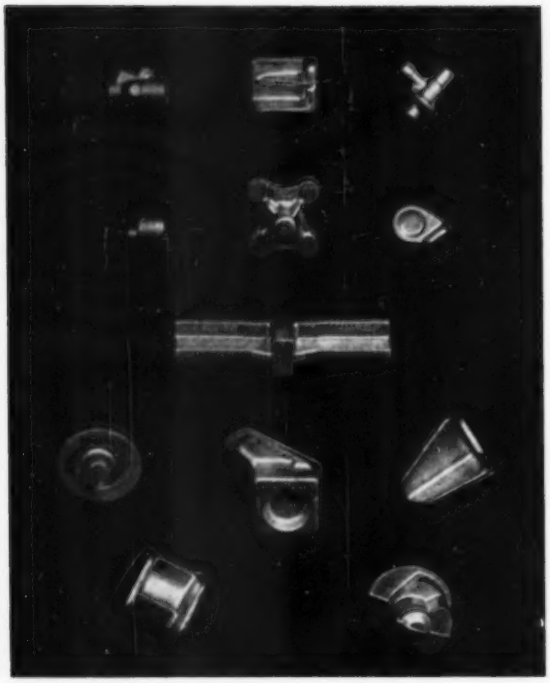


Fig. 1—Group of aluminum press forgings produced in the Willys-Overland plant at Erie, Pa. These forgings weigh from four oz to six lb each and are made in presses of 750- to 2500-ton capacity.

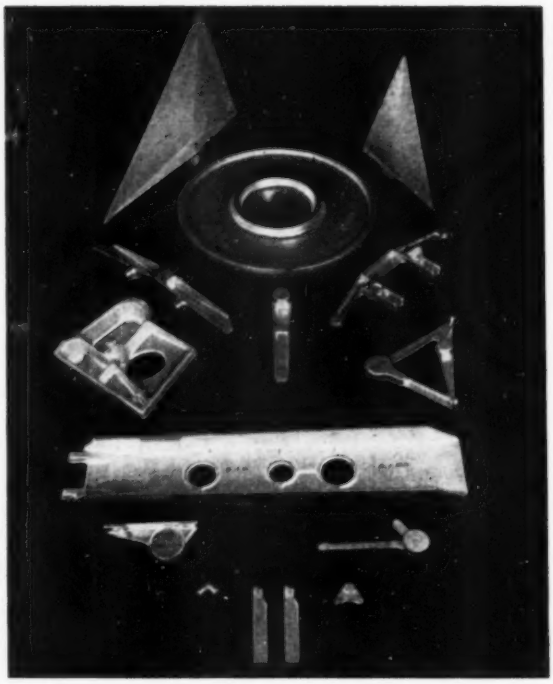


Fig. 2—Aluminum drop forgings that weigh 1½ oz to 45½ lb each and are made on hammers of 1600- to 20,000-lb rating. Some have remarkably thin sections that, in certain instances, taper to only 0.030 in. at the edges.

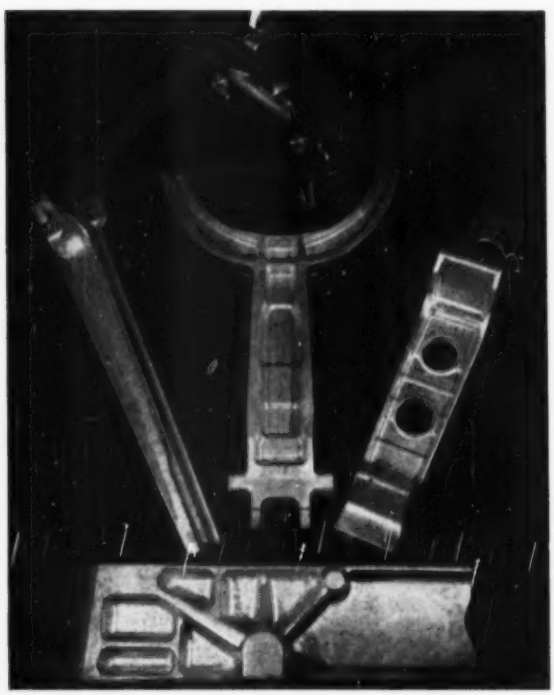


Fig. 3A—Group of large aluminum drop forgings. Smallest part in this group weighs 33½ lb; heaviest, 82 lb.

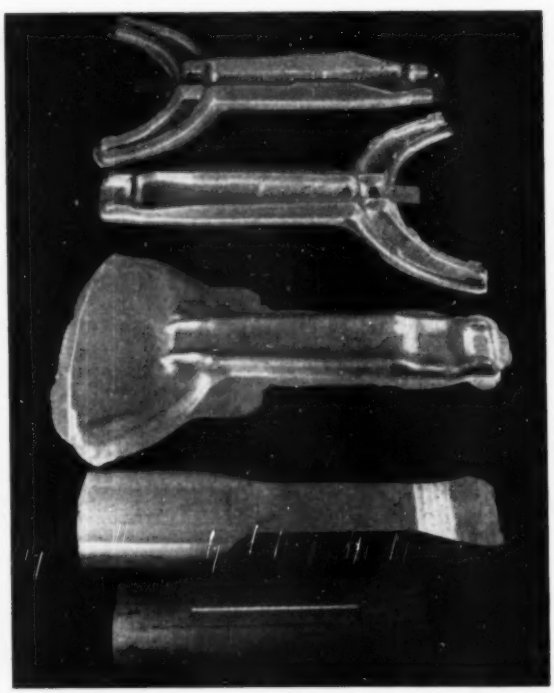


Fig. 3B—Successive stages in producing a 72½ lb aluminum drop forgings from 7 in. dia by 24 in. long billet.

Willys' Reactivated Aluminum Forge Plant

Wide Variety of Aluminum Forgings Made on Hammers and Presses in Government-Owned Plant. Some Hand Forging Still Done. Most of Output Heat Treated and Aged.

By J. H. Pargeter
General Manager, Aluminum Forge Division
Willys Motors, Inc.

INCREASED demand for aircraft landing gear, airframe members, and engine parts of drop forged aluminum alloys, has resulted in the reactivation of the Government-owned forging facilities in Erie, Pa. This plant, now operated by Willys Motors, Inc., is in quantity production again, after being closed following World War II. Excellent and varied equipment permits the drop forging, in cavity dies, of forgings weighing from a fraction of an ounce to 200 lb. The same facilities permit the hand forging, on flat dies, of blanks as heavy as 400 lb.

Because press forging is faster and requires less operating skill than hammer work, forgings that are relatively symmetrical and not over 50 lb in weight are produced on mechanical presses ranging from 750 to 2500 tons capacity. Typical examples of such forgings appear in Fig. 1.

Forgings with more complicated unsymmetrical shapes, and weighing as much as 200 lb, are produced in cavity dies on hammers. Both board drop and steam drop hammers are available, ranging in size from 1600 to 20,000 lb rated capacity. Drop forgings weighing 1½ oz to 45½ lb appear in Fig. 2. Figure 3A shows a group of relatively large die forgings, the smallest of which weighs 33½ lb, the largest, 82 lb. Successive stages in producing a 72½ lb forging from a 7 in. dia by 24 in. long billet are shown in Fig. 3B.

Hand forgings, varying in size from 1¼ by two by six in. to six by eight by 48 in., as shown in Fig. 4, are produced on steam drop, or double frame or open frame smith hammers, operated by highly skilled hammermen. Figure 5 shows such a forging being drawn on flat dies in a 12,000 lb steam drop hammer. Hand forged bars are supplied chiefly for hogging out machined parts which will have the properties of forged material until cavity dies are sunk or until quantity requirements warrant die investments.

The first step in the forging process is to cut the bar stock into billets of approved minimum size. Currently most forgings are made from either 14S or 75S alloy. Bar stock under ⅝-in. diameter is sheared to length. The greatest tonnage, in diameters up to five in., is cut on Cutamatic machines with a 20 by ⅛ by one in. Carborundum Aloxite rubber bonded abrasive wheel of A-26-RR grade, running under a flood of coolant. Following cutoff, resulting burrs are removed on an abrasive wheel. Figure 6 shows both the Cutamatic machine and the deburring wheel. Bar stock

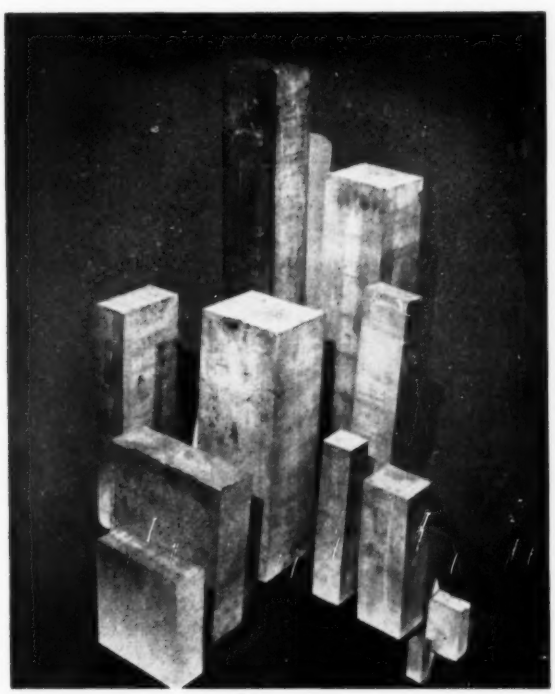


Fig. 4—"Hand" aluminum forgings range in size from 1¼ by two by six to six by eight by 48 in.

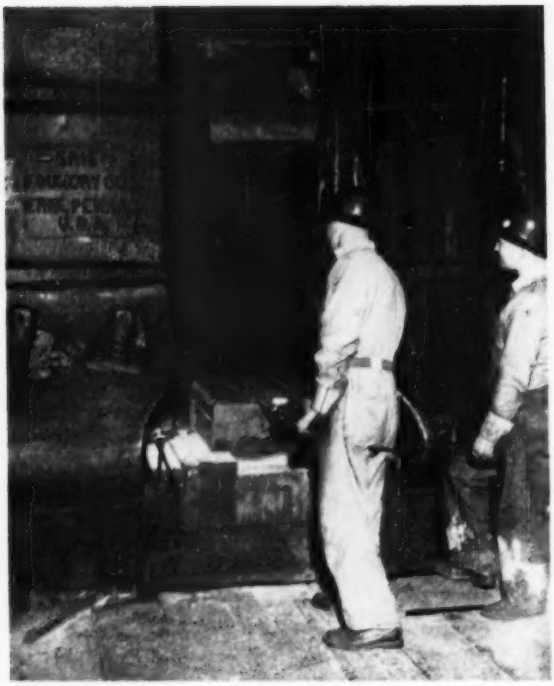


Fig. 5—Drawing billet to three by three by 28 in. on 12,000 lb hammer to produce "hand" forging similar to those shown in Fig. 4.

Fig. 6—Cutting forging stock to proper length with a Cutamatic saw. Deburring wheel is located to the rear of the saw operator.

over five in. diameter is cut to length on a Motch & Merryweather machine equipped with a saw blade, having inserted high speed steel teeth, running in a stream of coolant. Saw chips are collected by an overhead system which separates the chips and deposits them in a collection hopper.

Billets are next raised to the optimum forging temperature of 800-850 F in closely controlled batch or continuous type furnaces located adjacent to the forging equipment. The equipment having high tonnage rates per hour has the continuous furnaces. The temperature range must be carefully maintained, for at higher temperatures the aluminum alloys become hot-short, and at low temperatures, the metal will not flow properly. Even at the optimum heat, aluminum is less plastic than steel, requiring greater pressures to achieve flow, and making the forgings of aluminum is correspondingly more difficult.

All furnaces burn natural gas, but are equipped to use propane from a 20,000 gal standby supply in the event that the supply of natural gas is cut off.

After reaching the forging temperature, the billets are ready for hammer or press operations. Drawing, fullering, rolling, or edging on side cavities are frequently employed before the billet is placed in the forming die cavity. Depending on the shape of the forging, as many as two preliminary forming cavities may proceed that which gives the forging its final shape and size. One or more reheats may be required in this process. These operations are performed by hammer crews commonly consisting of three men, but which may have as many as seven for heavy parts. A crew normally has a hammerman and two helpers, one of which is an oiler, the other a furnace tender.

In Fig. 7 is shown a 25-lb landing gear forging about to be removed after blocking in a 12,000 lb steam drop hammer. A landing gear trunnion is shown in process in the same hammer in Fig. 8, where the entire crew plus supervision are seen as well as a continuous furnace and trim press in the background.

Most trimming of flash from the finished forging on small to medium size forgings is done cold on dies in mechanical presses, unless the run is too small to warrant the expense of dies. Die punches and some blades are being sand cast of Kirksite (a zinc alloy) using the forging as a pattern, thereby cutting down on the amount of machining. Large forgings are trimmed on band saws.

Prior to all inspection, or chip and mill operations, the forgings are pickled. The first tank contains a 20-25 per cent solution of sulphuric acid plus 3 per cent chromic acid, heated to 160-180 F. After five min in this pickle, parts are cold rinsed, and then dipped from ½ to two min in 17.1 per cent caustic soda solution at 160-180 F. This is followed by a cold rinse, and a two-min bright pickle in the same acid mix first used. Cold and hot rinses complete the cycle in an elapsed time of about 10-12 min. Stainless steel baskets are used to handle the forgings in all pickling operations.

To establish the necessary physical properties, the forgings are next solution heat treated in one of three

Fig. 7—Removing 25 lb landing gear fitting from dies after blocking on 12,000 lb steam drop hammer.

Blocking Operation

Fig. 8—General view of crew and supervision during blocking operation of landing gear trunnion on 12,000 lb steam drop hammer.

resistance-heated General Electric roller hearth continuous furnaces that feature automatic quench operation and temperature control. These furnaces appear in the foreground of Fig. 9. This treatment requires a varying time cycle, depending on forging size, at 940 F for 14S alloy, and 865 F for 75S alloy. After quenching, the forgings are put through one of three aging furnaces of the same make and type as used for solution heat treating. Aging of 14S alloy forgings requires nine hr at 340 F; 75S alloy, 24 hr at 250 F.

During the heat-treat and aging cycle, forgings are handled in steel baskets as shown in Fig. 9. This illustration also reveals the careful loading arrangement necessary to avoid the distortion during heat treat that would arise from random stacking. Hydraulic presses are located adjacent to the furnaces to correct any bends occurring during the heat-treat cycle, because of the relieving of internal stresses.

Following heat-treat, the forgings are pickled to remove all oxides formed during heat-treat prior to final inspection.

Most forgings made in this plant are for aircraft and are subject to exacting, military specifications. The final inspection department checks all work to insure adherence to these specifications. In fact, all production steps, as well as inspection, are rigidly controlled by Government and purchaser specifications.

Although general forging practice is similar to that of the steel forging industry, aluminum forging entails adherence to such differences in procedure as are imposed by the dissimilarity of the raw materials.

Solution Heat Treating

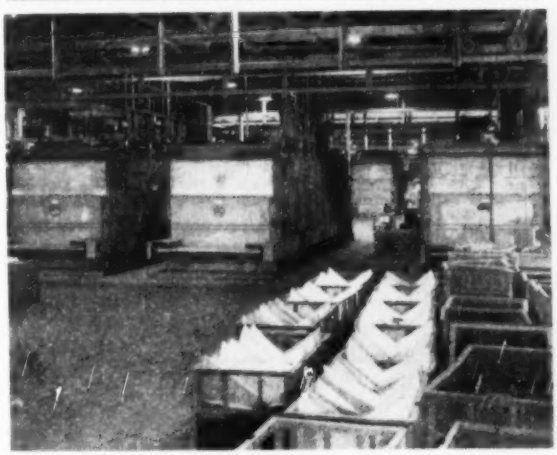


Fig. 9—Basket loads of aluminum forgings and a battery of three electric roller hearth furnaces for solution heat treating. A second row of similar furnaces, one of which is visible in the background, age the forgings subsequently.

Welding Axle Housings in Automatic Machines

Fig. 1 — Chevrolet passenger car rear axle made from stampings that are assembled by a series of flash, projections and arc welds. About fifteen million such axles have been produced.

By L. E. Feeney
Plant Engineer
Chevrolet-Detroit Gear and Axle Division
GENERAL MOTORS CORPORATION

Fig. 2—National welder setup in which two spring seats and two smaller stampings are projection welded to the main housing in each cycle. This is automatic except for loading of parts and unloading the assembly.

BANJO type rear axle housings for Chevrolet passenger cars and light delivery cars are among major components produced by the Chevrolet-Detroit Gear and Axle Division. To date, many millions of these assemblies, Fig. 1, have been fabricated and continue to be turned out at a high rate.

Major stampings constitute the two halves of the housing and are flash welded along the four longitudinal joints that extend from the banjo to the end flanges. Subsequently, these assemblies go to National welders, of which one appears in Fig. 2, where two stamped spring seats, a pipe clip and a hose connection bracket are projection welded to the tubes. Several of these projection welders are used.

In each of these setups, the pipe clip and hose connection bracket are first loaded in heads that are back of and below the tubes and are partly hidden in Fig. 2. Then the housing is set in place and located by the banjo at the center and in copper alloy seats below the two end heads, in each of which a spring seat is placed. These heads close in sequence and make the four projection welds that fasten each spring seat in correct locations.

Although the spring seat welds possess considerable strength, they are tack welds in effect, and are supplemented by two arc welds that complete and greatly strengthen the fastening of the seats to the housing. Such arc welding, described below, is essential because the spring seats are subjected to severe stresses and to almost constant pounding in service.

To complete the welding of each axle, several light machines such as the one in Fig. 3, are employed. Each of these machines has six Westinghouse automatic arc welding heads that feed coated electrode wires from six reels mounted as shown. Each head receives power from a common bus connected to a central generator station providing direct current at 60 volts. Generator output for normal production is 8000 amp. Power is provided by two 100-kva and three 200-kva motors driving generators in parallel and connected to the common bus from which welding heads are served.

Each welder is loaded by hand with an axle housing that has come from one of the projection welders. In

loading, the housing is placed in a cradle and is clamped hydraulically at the center, being located by the banjo and with the ends of the tubes projecting through spit rings. When so placed, hinged shields, shown open in Fig. 3, are lowered by hand and the operator then presses a button that starts the machine.

As this is done, the two end heads feed in ⅛-in. Sulphacoat wire and, as soon as the arcs are struck, the axle begins to rotate slowly and a bearing support is welded to each end as the housing is turned through a full 360 deg. Thus, two circumferal welds are made at the same time.

While these welds proceed, the other four heads feed in 5/32-in. coated wire. Each of these heads makes one weld at each side of each spring seat but only through a 45-deg arc, as this is the length of the contact between the tube and the seat stampings. As the arcs are not submerged, they are made inside of sheet steel enclosures. These include the hinged covers and not only confine sparks but keep light from the arcs shielded.

As all six welds are made automatically, the operator of the machine merely loads it, closes the covers, presses the start button and waits for the cycle to be completed. When completed, the machine stops, covers are opened, the weldment is unlocked and removed and is placed on a monorail conveyor. Then, a new assembly is put in place to start the next cycle. Each machine is capable of averaging about 41½ cycles an hour.

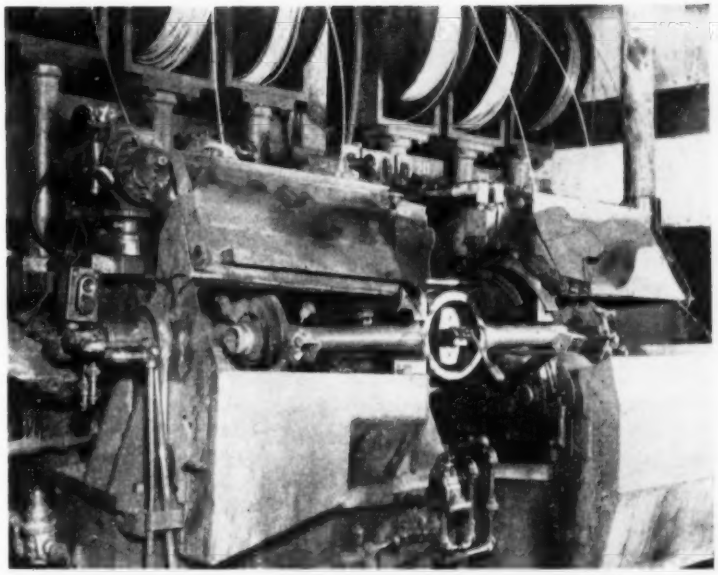


Fig. 3—One of the special six-head arc welding machines. Each axle housing clamped in the cradle is rotated 360 deg per cycle. One head at each end welds bearing housings and flanges to the assembly. Four heads make welds extending 45 deg at each side of each spring seat. Hinged covers shown open are closed while welding proceeds.

Excellent welds result and, as each is made under precisely and automatically controlled conditions, the welds are uniform in quality, besides being made at high speed and with minimum labor. Some of these machines handle passenger car axles and others produce axles for light commercial trucks. Truck axle machines are nearly the same as those for passenger cars but do involve some slight differences.

As these machines have welded an average of close to two million axles each, they have made outstanding records and abundantly demonstrated utility of automatic arc welding assemblies of this type.

• • •

Government Makes Deal for Canadian Nickel

The Defense Materials Procurement Agency has concluded a contract with International Nickel Co. of Canada, Ltd., for the purchase of 120 million lb of metallic nickel and 100 million lb of electrolytic copper. Deliveries under the contract are expected to start next December and will be at the rate of two million lb of the former and 1.6 million lb of the latter per month.

Purchase price of the nickel will reflect the current market price, plus an allowance for amortization and additional costs of production. The electrolytic copper price is $.27 (Canadian) per pound. Both prices, however, are subject to an escalator clause geared to an index of changes in specified economic factors.

All of the nickel bought under the agreement will be obtained from mining and treating 10 million tons of underground ores, which are not commercial in their present condition, with new mining and metallurgical developments.

Republic, Air Force Sign $50 Million European Pact

U. S. Air Forces, Europe, on behalf of the U. S. Government, has signed a $50 million contract with Republic Aviation (International), S. A. (newly formed subsidiary of Republic Aviation Corp.) of Lugano, Switzerland, for production in Europe of F-84F Thunderstreak jet fighter spare parts. The parts are to be paid for under the Mutual Defense Assistance Program and will be allocated to NATO nations for maintenance of the swept-wing fighters.

Actual fabrication will be done by sub-contractors in Europe, under supervision of Republic International, which will place sub-contracts, provide special tooling when needed, and lend technical assistance. All parts produced under the contract will be interchangeable with original F-84 equipment and U. S.-built spare parts, according to the announcement.

Anti-Friction Bearings Stabilized in Sub-Zero Refrigerating Machines

By J. D. Fitzpatrick, Chief Metallurgist, the Kaydon Engineering Corp.

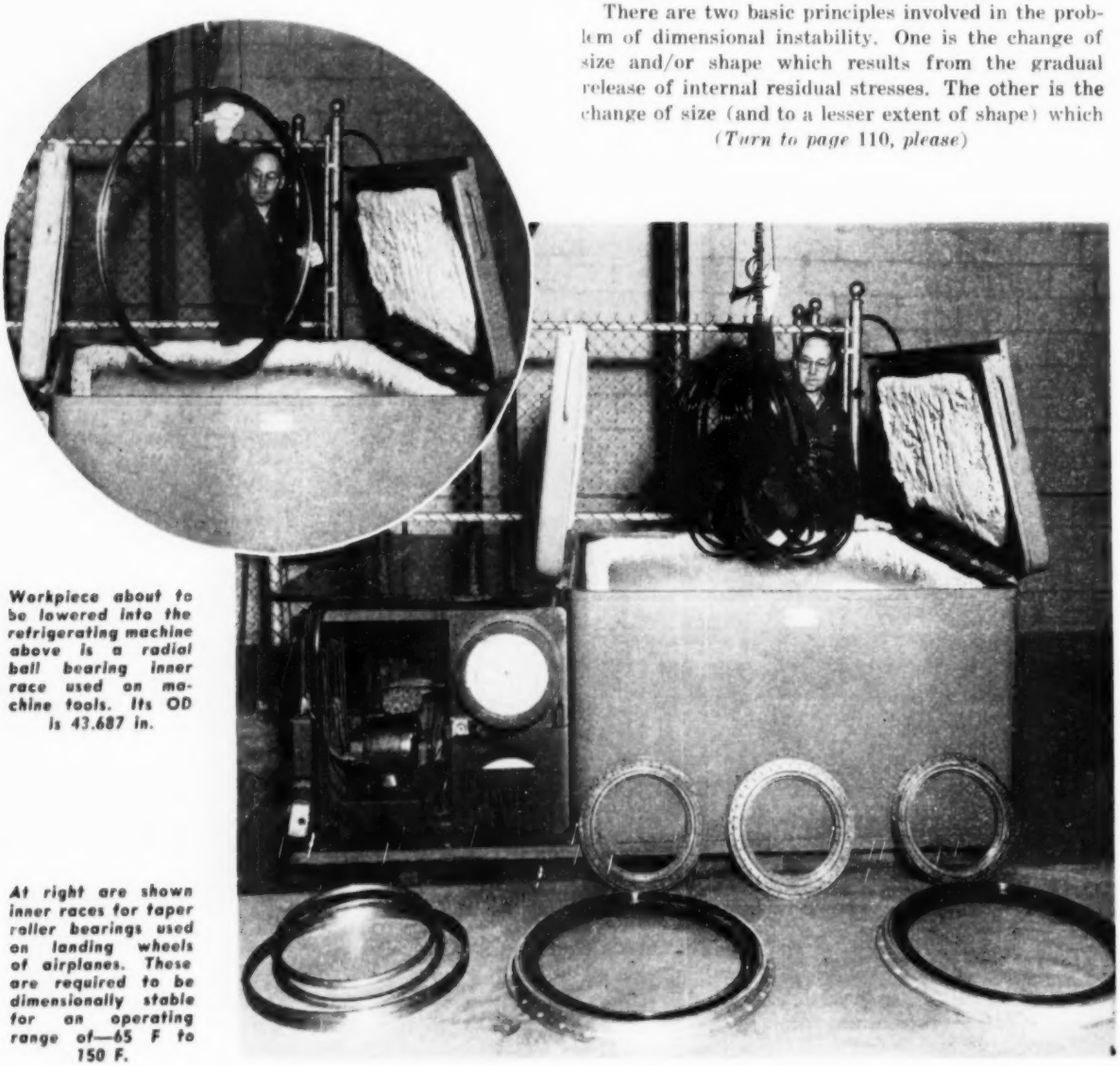
THE anti-friction bearing industry has long been famous for the precision of its products. This precision, which is the result of expensive equipment and painstaking procedures, must be maintained during the useful life of the bearings. In other words, the bearing components must be dimensionally stable. This is further complicated by operation at temperatures which may range from −65 F to +150 F.

It is natural, therefore, that the bearing industry is vitally interested in all phases of dimensional stabilization, and has pioneered and sponsored many innovations and processes to this end.

Paralleling the growth of metallurgical knowledge during the past quarter century has been the development of new equipment permitting the industry to apply this knowledge. Outstanding examples are the industrial sub-zero refrigerating machines.

There are two basic principles involved in the problem of dimensional instability. One is the change of size and/or shape which results from the gradual release of internal residual stresses. The other is the change of size (and to a lesser extent of shape) which

(*Turn to page* 110, *please*)



Workpiece about to be lowered into the refrigerating machine above is a radial ball bearing inner race used on machine tools. Its OD is 43.687 in.

At right are shown inner races for taper roller bearings used on landing wheels of airplanes. These are required to be dimensionally stable for an operating range of—65 F to 150 F.

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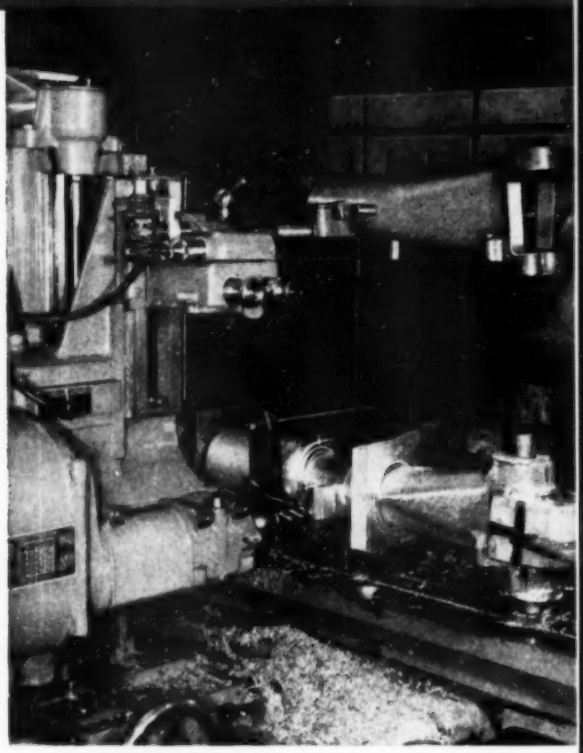
ON A PRATT & WHITNEY TYPE BL KELLER MACHINE *because*



PROTOTYPE Machining of an experimental aircraft part from a solid billet

"*KELLERING*" REPRODUCES COMPLEX, IRREGULAR SHAPES FASTER, MORE ECONOMICALLY . . .
"KELLERING" — automatic tracer-controlled milling — easily handles irregular and complex shapes that otherwise would be difficult to machine by any other conventional method. The initial job is done economically, and additional duplicates can be produced at a fraction of the usual time and cost.

KELLERS ARE DESIGNED AND BUILT *SPECIFICALLY* FOR TRACER-CONTROLLED MILLING . . .
not just "adapted." Complete, versatile, powerful and provided with a wide range of spindle speeds, they're ready to take on an unlimited variety of jobs without needing major adaptation by expensive attachments.

THEY'RE RUGGED, DEPENDABLE, STAY ON-THE-JOB . . .
year after year without frequent or expensive maintenance.

HORIZONTAL CONSTRUCTION PROVIDES MAXIMUM STRENGTH, RIGIDITY, EFFICIENCY and CONVENIENCE . . .
workholding and positioning are simplified, and the open side construction places no limitation on the size of the work piece. Chips and coolant fall out of the work cavity, cutting is fast and free, without clogging. Operator always has a complete view of cutter and work. Full push button operation is centralized on a single control panel.

ELECTRIC TRACER CONTROL . . . is dependable, relatively simple and retains its high initial accuracy without frequent maintenance or complicated adjustment. Master forms are duplicated PRECISELY. Machine uses two types of tracer control: ***Profiling*** to a pre-set depth following an outline template; and ***3-Dimensional Milling*** using an inexpensive model as a master.

KELLER TYPE BL IS A VERSATILE, HANDY SIZE MACHINE — JUST RIGHT FOR MANY AVERAGE JOBS IN YOUR SHOP . . .
two standard sizes are available, 24" x 16" and 36" x 20" — both with 8" transverse travel. Both can be furnished as Three-Spindle Machines with 8" or 10" center distances between spindles.

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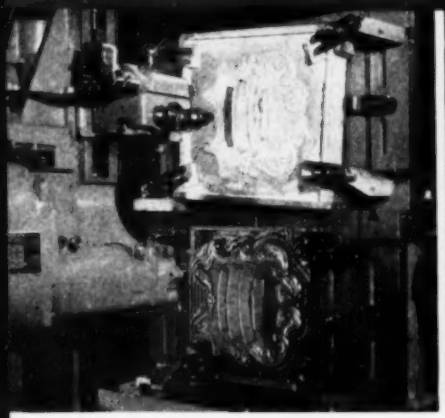
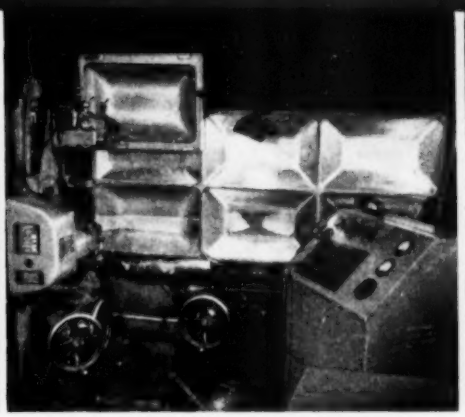
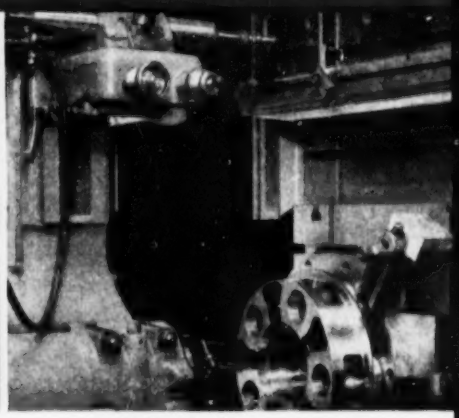


PLASTIC MOLD, intricate 3-dimensional milling from a plaster model



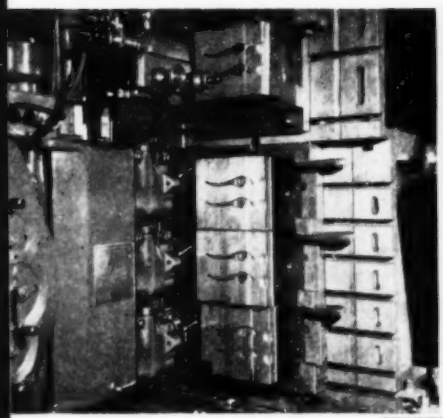
RUBBER MOLDS, six from a single master, for foam rubber pillows



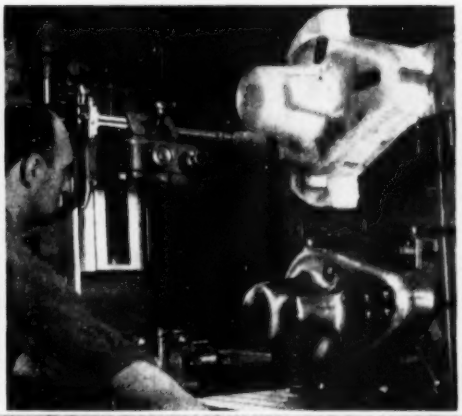
INDEX PROFILING, machining five cavities requires only a single master

BY TRACER-CONTROLLED MILLING

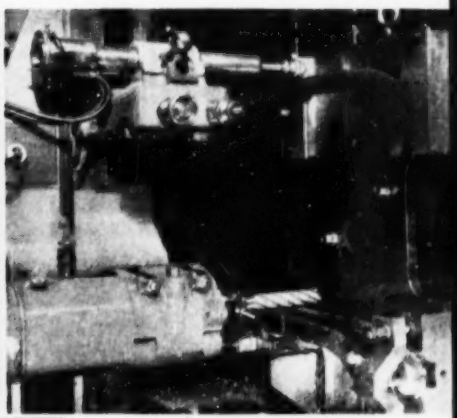
PLASTIC MOLDS • RUBBER MOLDS • FORGING DIES • METAL FORMING and DRAWING DIES
DIE CASTING DIES • METAL PATTERNS • CAMS • PROTOTYPE WORK • PRODUCTION MILLING
and MANY OTHER JOBS WHERE IRREGULAR SHAPES MUST BE MACHINED



3 FORGING DIES machined simultaneously on a 3-Spindle Keller



DIE CASTING DIE for a power lawn mower motor housing



PRODUCTION MILLING, profiling an aircraft landing gear component

FOR COMPLETE INFORMATION, write us for P&W Circular No. 490-3 fully describing the Type BL Keller Machine.

PRATT & WHITNEY
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SELF-LOCKING "PLACE" BOLTS

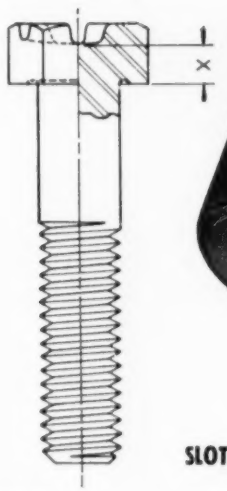
...cut costs...add strength

. . . wherever involuntary loosening or fatigue are a problem!

In some typical automotive and farm equipment applications, for instance, "Place" Bolts are being used as connecting rod bolts, main bearing cap screws, and flywheel bolts.

Here, and wherever a locking bolt may be needed, the Slotted-Type "Place" Bolt offers not only positive locking action but economy and additional strength. It cuts costs because no additional parts or operations are needed. It adds strength because its controlled spring action guards against impact, shock and fatigue failures.

National makes the Slotted-Type "Place" Bolt in carbon or alloy steel, in any of a wide range of sizes. Write us for additional information, including our illustrated folder.



HERE'S HOW SLOTTED-TYPE HEAD LOCKS

The flexible diaphragm formed between slotted segments in the upper face of bolt head and circular recess adjacent to the shank in lower face (section X) acts as controlled spring element when head is properly wrenched against a rigid seat. Diaphragm is reinforced by the continuous-grained segment cold formed between upset slots in upper face.

U. S. Patent No. 2543705

THE NATIONAL SCREW & MFG. COMPANY

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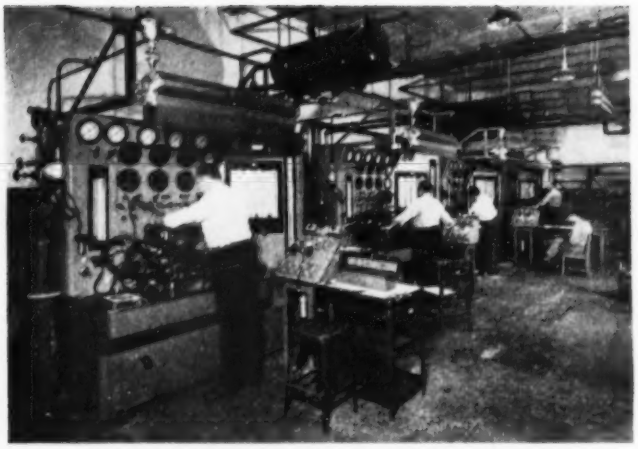
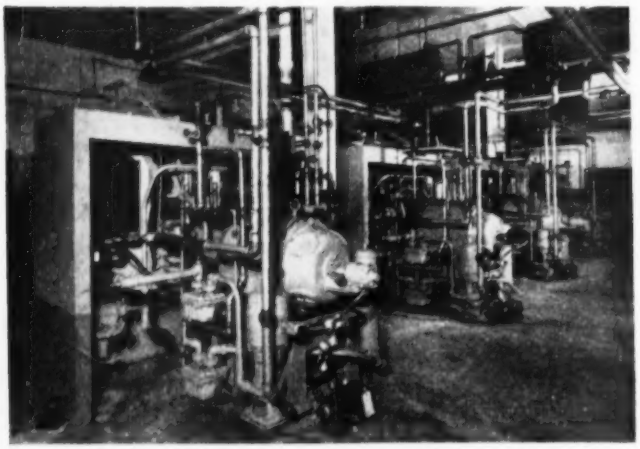
National PRODUCTS

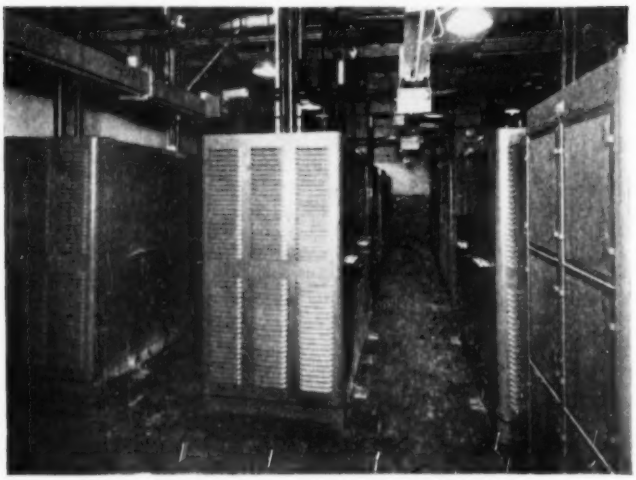
FASTENERS HODELL CHAINS CHESTER HOISTS



Obtaining flight data from the test stands. Note convenient Reliance V★S Drive controls to the right of each operator.



Adjustable-speed drive motor for each of the 25 stands is a 75-horsepower explosion-proof Reliance Heavy Duty Type 'T'.



Reliance V★S Drive control units can be placed at any convenient location. Here they have been put in a separate room.

25 JET TEST STANDS

powered by RELIANCE V★S DRIVES simulate engine flight conditions at 50,000 feet . . . .

Using 25 specially designed test stands, the Holley Carburetor Company tests fuel-flow governors under conditions similar to those they will encounter in jet engines splitting the air from sea level to 50,000 feet up. Through grueling test periods, generally in excess of 24 hours, these test stands ask a lot of their drives.

The Reliance V★S Adjustable-speed Drive . . .

1. Supplies the needed driving power despite tremendous loads caused by simulating ram and flight conditions.
2. Guarantees speed regulation of one-half of 1%—or better—within half a second.
3. Provides convenient, easy-to-operate controls.

A Reliance Electronic Regulator coordinated with each drive provides the precise speed regulation required for the success of the test. As the governor takes over regulation of the speed, the electronic regulator performs the vital function of preventing any over-run of speed as the load decreases.

The outstanding job being done on these test stands offers one more example of the versatility and flexibility of Reliance V★S Drive. For more detailed information about Reliance V★S, the original packaged all-electric adjustable-speed drive for a-c. circuits, write for Bulletin D-1445.

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Huge Furnace Being Built by Westinghouse to Heat Treat Aluminum Extrusions for Aircraft Will Be World's Tallest.

Industry Silent On Heavy Press Cutbacks

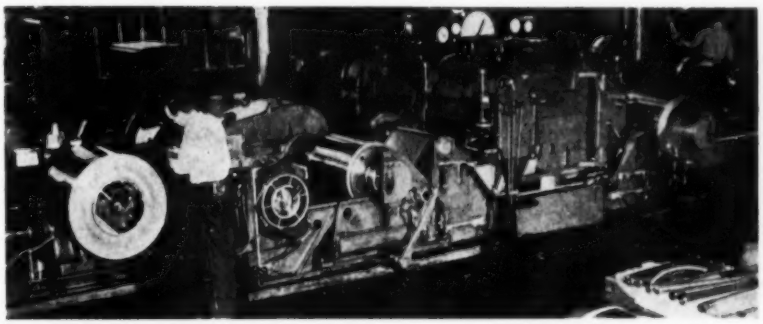
After checking various sources involved in the recent cutback of heavy forging and extrusion presses, the general consensus was "no comment." Although no one involved wished to be quoted, there is probably a great deal of activity going on in an effort to have at least some of the equipment placed back on the schedule. All of the seven presses cancelled were due for delivery in 1954 and some of them were at least ¾ completed. When Air Force Secretary Harold E. Talbott announced the cutback, he stated that the use of the equipment "involves some technical and developmental problems which will take time to work out." However, Mr. Talbott did not explain his reference to "problems"; though it is felt that there is some concern about the difficulty in the finishing of die sets for the huge presses.

T-a-l-l Furnace

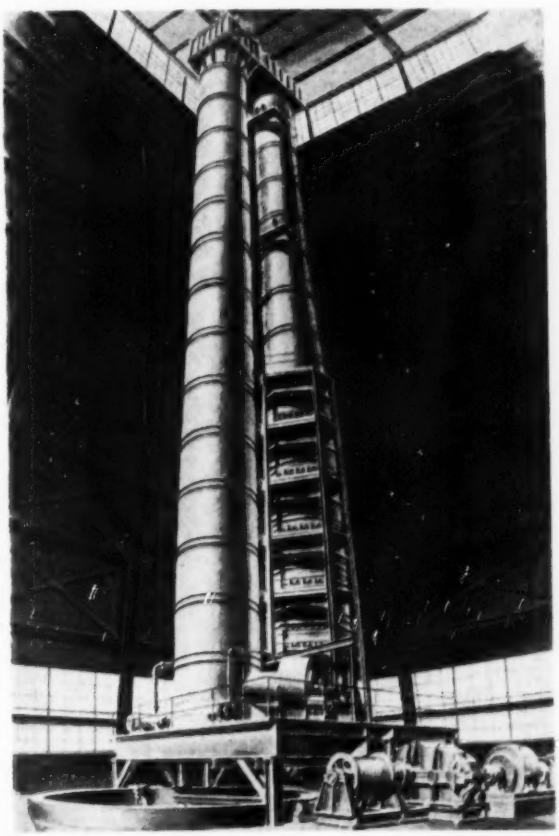
What is claimed to be the world's tallest furnace is being built by Westinghouse at its Industrial Heating Department plant in Meadville, Pa. The furnace's 130-ft tower, shown in the illustration, will be used to heat-treat long, extruded aluminum shapes required for aircraft manufacture. Aluminum pieces 110 ft long will be suspended in the tower for specified periods of time. At the end of the heat bath, the suspended pieces will be quenched in a water-filled pit of sufficient depth. In a furnace such as the one shown, the temperature difference between the top of the tower and the bottom will be held to less than five deg. Scheduled for completion about the middle of 1954, the unit will be gas fired and a high rate of air circulation will be maintained.

British Laud American Development

At the annual convention of the National Association of Drop Forgers and Stampers of England, held last month in Perthshire, Scotland, Eugene C. Clarke, president, Chambersburg Engineering Co., Chambersburg, Pa., presented a film on the Impacter (AUTOMOTIVE INDUSTRIES, Dec. 1, 1952) by special invitation. The film demonstrated the theory of the Impacter and showed various Impacters at work forging knife handles and turbine blades. (*Turn to page* 142, *please*)



At Rodney Metals, Inc., New Bedford, Mass., this 25-in. Sendzimir mill cold reduces carbon steel to as thin as 0.001 in., and stainless steel to 0.002 in. It is said to maintain an accuracy within three per cent across widths up to 25 in. The mill is also used to cold reduce aluminum alloys.



Now under construction by Westinghouse for its Meadville, Pa., plant, this furnace is said to be the world's tallest. Extending 130 ft into the air it will be used to heat treat extruded aluminum used for aircraft manufacture.

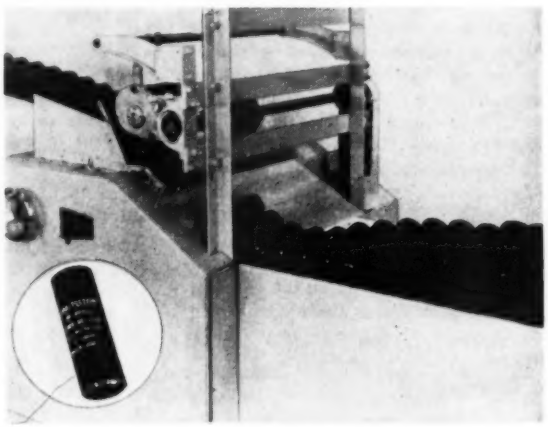
NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

Cylinders Printed by Automatic Machine

A machine for automatic printing of cans, canisters, tubes and other types of cylindrical products ranging from one in. to 12 in. diam and 1½ in. to 48 in. in length as part of an existing production operation has been introduced. Called the Auto-Cylindaprinter, the machine is designed to print either complete legends or changeable codes and lot numbers on containers as they are packed. Copy changes and adjustments for cylinders of different sizes may be readily made.

Cylinders, loaded or empty, may be fed to the Auto-Cylindaprinter either automatically or manually. Also, since the machine is self-synchronizing, feeding need not be regularly timed or spaced.



Gottscho automatic cylinder printing machine.

The machine is said to print sharp, permanent impressions on smooth or rough surfaces . . . fiber, paper, metal, plastic, etc., at speeds up to 80 units per min. The machine uses quick-drying ink of almost any color, including metallic, to meet all government and commercial specifications. It holds an eight-hr supply of ink. The machine is sturdily built, engineered for trouble-free operation and occupies floor space of 30 in. by 43 in. and is 50 in. high. With slight modification it can be adapted to printing slightly tapered cylinders, such as projectile noses. *Adolph Gottscho, Inc.*

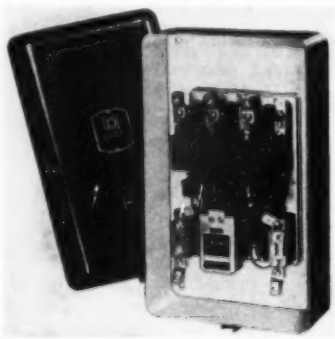
Circle E-1 on page 73 for more data

Size 4 Vertical Action Starter

NEMA Size 4 vertical action starter is being placed on the market. With maximum polyphase ratings of 50-hp 220 v, 100-hp 440-550 v, the starter is considerably smaller than the clapper type starter it replaces. Overall dimensions of the open type starter are only 9¼ in. wide, 14¾ in. high, 7-3/16 in. deep.

Contacts used on the device are silver, and double-break. The armature has straight line motion, guided at top and bottom.

All parts are front mounted for accessibility in service and maintenance. All contracts may be inspected by removing the arc chamber covers and may be removed or replaced without disturbing line or load wiring.



Square D size 4 vertical action starter.

As many as eight electrical interlocks (four normally open and four normally closed) may be added to the starter, either at the factory or after shipment. Interlocks are mounted on their own insulating base and can be fastened to the starter with two screws—without removing the starter from its enclosure.

The magnet has a built-in permanent air gap. Magnetic yokes in each arc chamber are said to increase rupturing capacity well beyond the maximum starter rating. *Square D Co.*

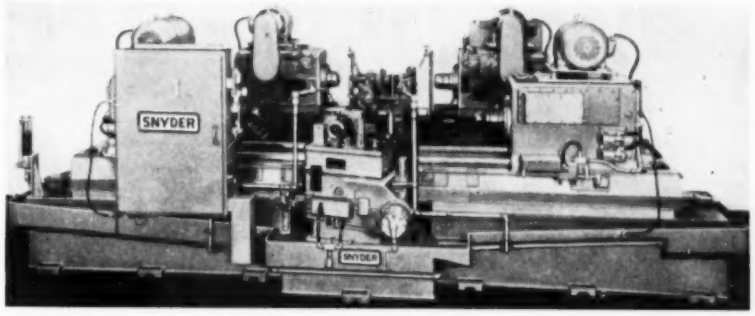
Circle E-2 on page 73 for more data

Landing Gear Cylinders Machined on Automatic Double-End Unit

A special automatic double-end machine for processing aircraft landing gear cylinders of alloy steel has been designed and built.

The workpiece is roughly cross-shaped, and the processing sequence is rough machining, heat treating, and finish machining. The machine consists of two double-end machine sections placed side by side. The part is manually loaded and clamped in the fixture and the fixture is loaded into one machine section and power clamped in position.

With the part in working position, the operator selects the proper tools and uses them in the required sequence, alternating from one end of the part to the other so that while an operation is being performed on one end, he is changing tools for the subsequent operation on the other end. The two trunnion ends are hollow milled and centered, and the two cylinder ends are bored, faced, and centered. Carbide and high speed steel tools are used. Two opposite ends of the part are processed in one section and the fixture is transferred to the second machine section and the other two opposite ends of the part are processed.



Snyder automatic machine for landing gear cylinders.

Each unit is controlled separately, and the work cycle is automatic. Feed start dogs and positive stop positions for the heads are selected through a rotating dograil and a movable end stop. The spindle noses in the head are provided with a quick change lock for holding the various tools.

Heads are provided with eight spindle speeds selected by moving two levers and varying from 43 to 416 rpm. Shift mechanism is interlocked so that the gearing cannot be damaged by incorrect positioning of the shift levers.

The units have a maximum of 30 in. of stroke and are capable of feed rates from ½ to 30 ipm. The units on one section of the machine are also provided with step drilling attachments for drilling deep holes in the trunnion section of the part.

Each section has its own hydraulic tank and pump and its own hand operated, centralized lubrication system.

Production rates vary with handling facilities and with the skill of the operators. Base and column are welded steel construction, reinforced and thoroughly normalized. Necessary floor space is 185 in. by 240 in. *Snyder Tool & Engineering Co.*

Circle E-3 on page 73 for more data

Threading Machine Suited for Large Diameter Work

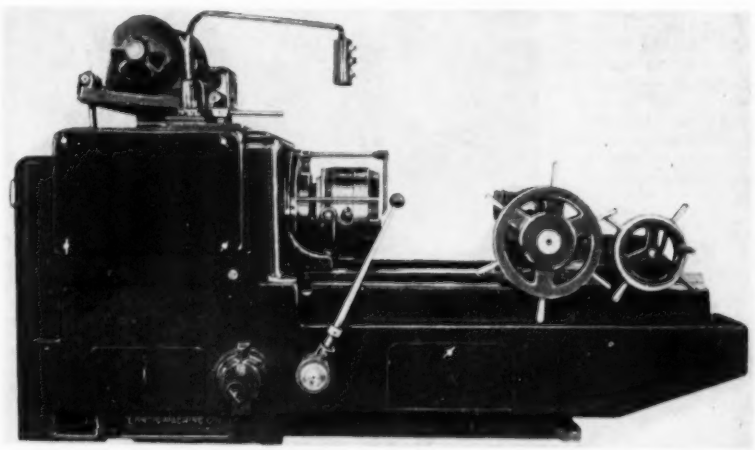
Development has been announced of a Landmaco threading machine for heavy-duty precision threading on large diameter work.

The machine is said to be of massive construction and is claimed to incorporate many improvements and new features. It is built in a single spindle model only at present, and is furnished either with or without the leadscrew attachment.

Bed of the machine is equipped with hardened and ground rectangular ways for guiding and supporting the carriage. The carriage is of heavy-duty design and gibbed to provide wear compensation. It is operated by a hand-wheel in connection with a rack and pinion.

The carriage front or vise is of a new design principle which reportedly assures proper work alignment under gripping pressure. This feature is combined with a hammer blow handwheel used to operate the grips.

A single gear shift lever is provided for a rapid speed change of 25 per cent for any given spindle speed as determined by the speed change gears in use. Three pairs of speed change gears provide 12 spindle speeds ranging from nine to 152 rpm.



Landis threading machine for large diameter work.

The machine is equipped with either the four in. standard rotary head or the new six in. (6-chaser) Lanco head. Both die heads are of sturdy construction and provide a rigid support for the chasers.

This Landmaco machine will cut bolt threads from 1⅛ in. to 6¾ in. diam, and pipe threads from one in. to six in. diam, up to 29 in. long with leadscrew and 30 in. without leadscrew. Pitch capacity ranges from two to 24 threads per inch. *Landis Machine Co.*

Circle E-4 on page 73 for more data

NEW EQUIPMENT PLANT · PRODUCTION

For additional information, please use postage-free reply card on page 73

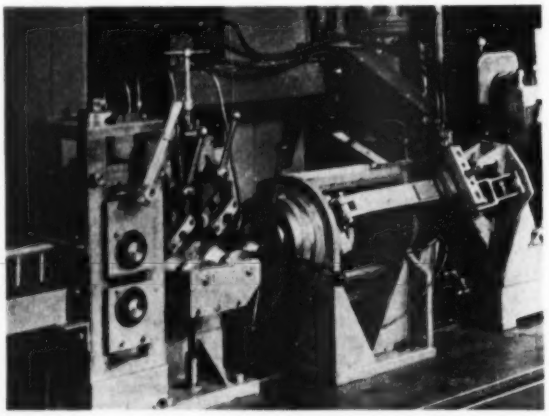
(*Continued from page 65*)

Machines for Welding Non-Ferrous Tubing at High Speeds

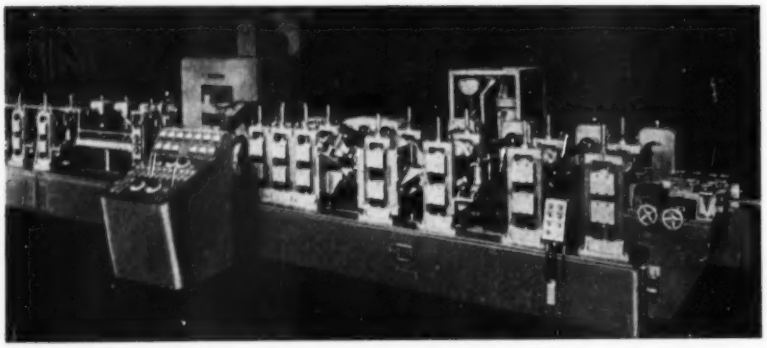
Two tube mills for converting coiled non-ferrous strip into welded tubing have recently been completed, and several more are said to be on order and are being built. The induction welding of the tubing by the process is done at speeds ranging from 40 fpm to 120 fpm depending on the kind of metal, gage, and diameter of tube.

The machine used for the process consists of a tube forming mill, welding equipment, and a sizing mill. A novel method of forming includes cluster of four edge forming rolls between third and fourth roll stands, and two three-roll idler clusters between the fourth and fifth stands. One of the mills was designed to make tubing from ¾ in. to four in. O.D. with a wall thickness from 0.025 to 0.134 in. *Yoder Co.*

Circle E-5 on page 73 for more data



The induction welding equipment incorporated in the Yoder process for making non-ferrous tubing. The inductor coil is held by an arm extending from the 50 kw oscillator housing, between the spreader and squeeze rolls.



Yoder non-ferrous tube mill.

Murphy & Miller all-purpose test chamber.

All-Purpose Test Chambers

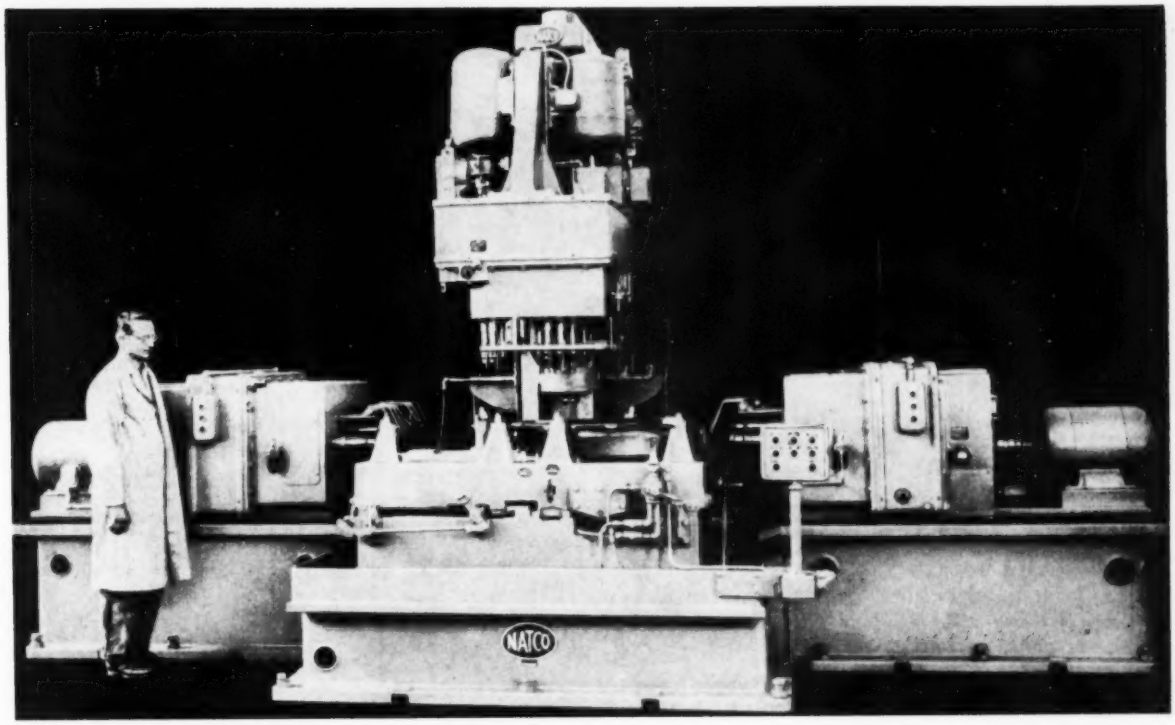
A line of multi-range, all-purpose test chambers capable of producing low temperatures to −130 F, high temperatures to 200 F and a standard humidity cycle of 20 per cent to 95 per cent from +35 F to +185 F, has recently been introduced.

A high capacity, low velocity forced air circulation system provided by a fan whose motor is mounted outside the cold test space, reduces temperature variation in the test space. Cabinets are heavily insulated with non-setting, low conductivity material. Welded seams on the heavy gage steel exterior panels assure positive vapor sealing of the insulation. Test spaces are stainless steel with welded watertight seams and include as standard, four ⅝ in. I.D. sleeved openings for introduction of electrical leads, hydraulic lines, etc. Another feature furnished as standard is an electric defrost system complete with safety controls. This feature prevents condensation on products being tested by increasing their temperature to ambient before removal from the test space.

A heavy duty electrical system with all major circuits separately fused is monitored by individual pilot lights and switches mounted on the master control panel. Control circuits are interlocked with fan and defrost cycles.

The refrigeration system is composed of a heavy duty, water-cooled, hermetically sealed, compressor-motor assembly of standard manufacture. Cooling coils are all copper with welded connections, and the design incorporates a high ratio of prime to secondary surface and is claimed to eliminate any possibility of oil trapping. *Murphy & Miller, Inc.*

Circle E-6 on page 73 for more data



NATCO automatic tapping and drilling machine.

Automatic Drilling and Tapping Machine

Now in production is an automatic holetapper and driller capable of drilling and tapping right or left hand tank case parts.

The left hand horizontal head and vertical head perform the following operations on left hand parts: position 1, remove and load; position 3, vertical head — tap four holes, left hand horizontal head — tap four holes; position 2, vertical head—idle, left hand horizontal head—tap three holes.

The right hand horizontal head and the vertical head are arranged to perform the following operations on right hand parts: position 1, remove and load; position 3, vertical head—drill eight holes, right hand horizontal head—tap four holes; position 2, vertical head—tap eight holes, right hand horizontal head—tap three holes.

Each cycle is automatic and performed by a single operator with convenient pushbutton controls. *National Automatic Tool Co.*

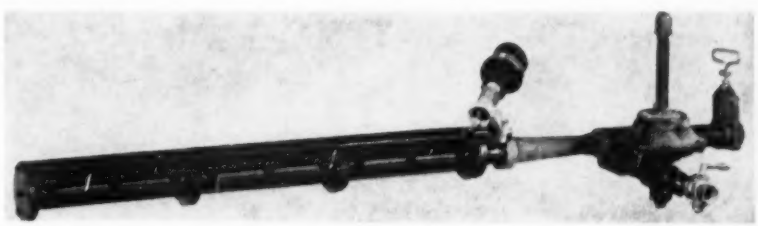
Circle E-7 on page 73 for more data

Gas-Fired Retention-Type Line Burner

Now in production is a gas-fired retention-type line burner for applications where heat must be distributed over a wide area by a continuous flame. The burner is said to be excellent for oven heating, kettle heating and air heating installations, including make up air systems for spray booths.

These line burners are of the blast burner design. The burners may be installed to fire in any direction: horizontally, vertically or downward. They are made of cast iron sections with drilled ports and steel retention lips for flame stability.

Each section is equipped with drilled and matched flanges, so they can be easily bolted together for a wide variety of continuous flame patterns. An adapter flange is available for applying either a blast or atmospheric pilot and flame failure protective equipment. *Eclipse Fuel Engineering Co.*



Eclipse gas-fired retention-type line burner.

Circle E-8 on page 73 for more data
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NEW EQUIPMENT PLANT · PRODUCTION

For additional information, please use postage-free reply card on page 73

(Continued from page 67)

Two Blast Machines for Production Deburring

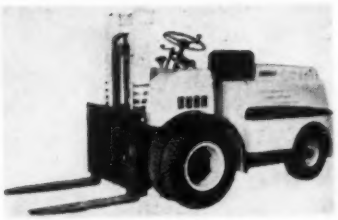
Production deburring of soft metal parts, using either a continuous rotating process for small parts or a stationary clamping arrangement for larger units, is possible with two standard Maizo blast machines that have been recently developed. Both standard machine types are designed to remove light burrs from metals in the range of aluminum to mild steel. In both models, maize, or a similar soft material, is blasted against the parts under factory airline pressure.

A ferris-wheel type fixture rotates continuously between two reciprocating blasting guns in Model MA-24 at the rate of approximately one revolution every five min. The revolving wheel carries 16 to 24 pieces in holding wires bent to suit the part and yields a production rate of 192 to 288 pieces per hour at 100 per cent efficiency. Higher production rates can be obtained, depending on the size of the part. A friction-driven slip clutch permits the operator to retard rotation if necessary. Speed of rotation can be varied as required by hardness of the parts being blasted by changing the drive pulley. Automatic transmission and aircraft parts are typical of those suited to the continuously operating unit.

A ½ hp motor belt-connected to a 3000 to 1 speed reducer drives the ferris-wheel. The reciprocating and oscillating blasting arms holding the guns are driven through a crank from a second speed reduction drive that has its own ½ hp motor. Housing is box-edge welded sheet steel. An access door is provided with a window for observation of parts during blasting operation. Normal plant air is all that is required for the machine, which operates at 60 to 80 psi. The blasting material is reused constantly in the closed system. It falls into a funnel after blasting, is picked up by the airstream and recirculated. There is a slight loss of blasting material, of course, in the form of dust resulting from the blasting operation. This requires connecting the unit to a ventilating system.

Larger parts not suitable to the continuous machine can be handled in Model MA-1, a stationary unit in which parts rotate on a fixed axis in a fixture. Typical parts handled in Model MA-1 are impeller housings, rotors, etc. Since the angle at which the blasting guns are set depends on the nature of the part in process, the guns are adjustable and machines can be supplied with two, four or six guns. A single ½ hp motor and speed reducer supply power for the unit. *Modern Industrial Engineering Co.*

Circle E-9 on page 73 for more data



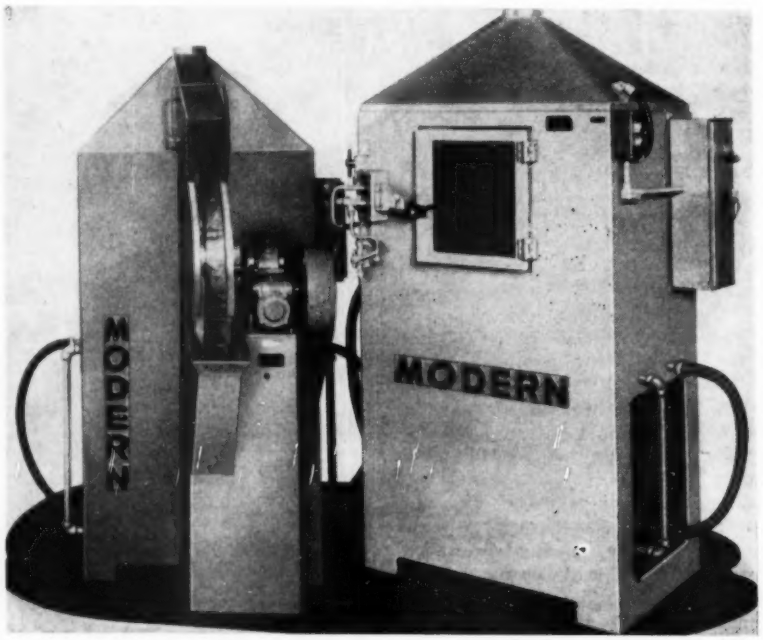
Buda 6000 lb capacity fork truck.

High Capacity Fork Truck

Development of two 6000 lb capacity, pneumatic tired fork lift trucks, Models FTP60-24 and FTPD60-24, has been announced. These trucks, available with dual or single drive wheels, have a load capacity of 6000 lb at a 24-in. load center and are available in all standard lift heights of 72 in., 84 in., 108 in., 114 in. and 120 in. Model FTP60-24 is powered by a heavy-duty Buda 6B-230 gasoline engine. A Buda Diesel, Model 6BD-230 powers the FTPD60-24.

The overall length, less forks, is 104¾ in. for the dual drive trucks and 106¼ in. for the single drive trucks. Turns in intersecting aisle: 91 in. for duals, 86¼ in. for single front tired trucks. All models are available with torque converters. *Buda Co.*

Circle E-10 on page 73 for more data



Modern blast machine, Model MA-24, is shown at left while the unit for larger work, Model MA-1, is at the right.

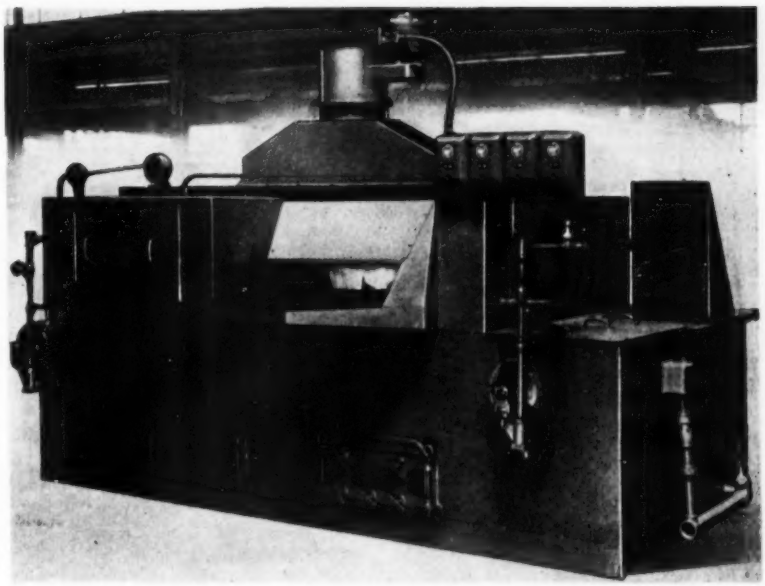
Washing Machine Equipped with Turntable

Recently designed is a washing machine that utilizes a turntable for conveying parts through the washing cycle. The turntable is loaded and unloaded at one station.

This unit is available in a variety of sizes, and the turntable is designed to accommodate all types of work, in various stages of manufacture. Special motor-driven pumps circulate the washing and rinsing solutions. The air, connected to the regular shop line, is controlled by an automatic trip mechanism so that air is "on" only as the work passes through the blow-off section. Correct operating temperature is maintained at all times by a Bellows operated thermostatic control valve in the heating line.

The equipment described above can be furnished for steam use or gas heat, and in special explosion-proof construction for use with petroleum solvents. *G. S. Blakeslee & Co.*

Circle E-11 on page 73 for more data



Blakeslee turntable equipped washing machine.

Jet Blade Taper Checked with Air Gage

An air gage assembly that is used to check critical dimensions on a jet engine turbine bucket blade simultaneously is a recent development. In one step an operator can check blade taper in relation to root form at three places along the leading and trailing edges and measure the length of the root form. The accuracy of each dimension is indicated by the position of floats in a seven column Precisionaire.

This multiple gaging assembly consists of a blade positioning fixture on which are arranged seven Plunjet gaging cartridges, and the seven column Precisionaire. The relative position between the Plunjet at the root form and those along one edge of the blade, is always the same since these gaging cartridges are positioned in a floating arm. Thus, a variation in root length, as long as it is within tolerance, does not prevent accurate inspection of taper.

Each gaging cartridge has its own glass column and indicating float—a feature which shows instantly whether each dimension is acceptable or has a plus or minus condition. Close grouping of the columns and the upper and lower limit tolerance markers on the face of the glass tubes, permit single-focus panoramic viewing of all float positions at one time. A calibrated product blade is used to position the floats. *The Sheffield Corp.*

Circle E-12 on page 73 for more data

(*Turn to next page, please*)

Sheffield air gaging setup for jet blades.

NEW EQUIPMENT PLANT · PRODUCTION

For additional information, please use postage-free reply card on page 73

(Continued from page 69)

Snap-Action Switches

Two precision snap-action switches, designed for one-way actuation by cams, dogs or slides, have been announced as available.

The switches have spring loaded, hinged roller arms actuators. One design has a 3/16 in. diam roller and the other a ⅜ in. diam roller. They are particularly useful in providing an electrical impulse to relays or solenoids from one direction only of a reciprocating movement.

Each of the switches is available with either solder lug terminals or screw terminals. They are listed by Underwriters' Laboratories for 15 amp, 125, 250 or 460 v, a-c; ½ amp, 125 v, d-c; ¼ amp, 250 v, d-c.

Characteristics of the switches are as follows: on the BZ-2RW825 model, operating force eight oz, maximum; release force 1½ minimum; differential travel, 0.015 maximum; on the BZ-2RW826 model, operating force 2½ to 6½ oz; release force 1¼ oz, minimum; differential travel 0.003 to 0.020. Contact arrangement of both switches is single-pole, double-throw. *Micro Div., Minneapolis-Honeywell Regulator Co.*

Circle E-13 on page 73 for more data

Micro precision snap action switch which has been designed for one way actuation. Hinged roller arm actuators are spring loaded.

Air-Operated Gage for Jet Engine Blades

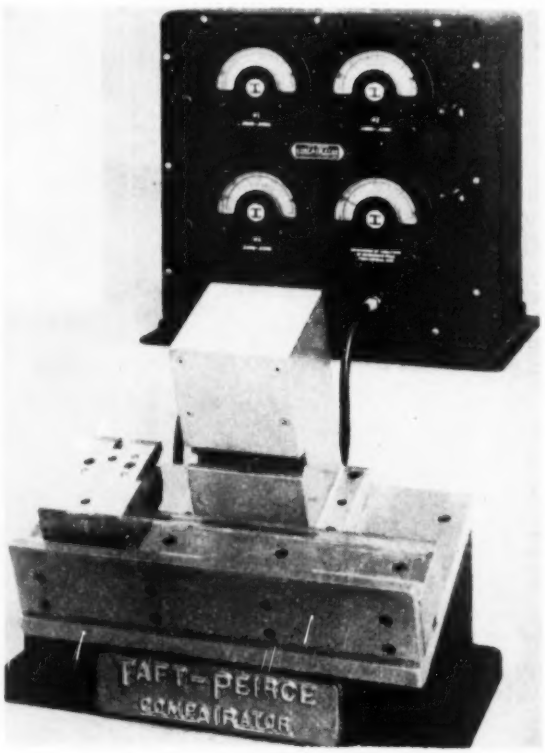
An inspection air-operated gage has been built which measures the dimensions over rolls of serrations in the root section of jet engine turbine blades.

The gaging fixture is made with tungsten carbide contacts, precision ground to a radius corresponding to the required roll dimension. These contacts are mounted on parallel reels so that they are free to move in both a vertical and a horizontal direction.

Three air indicators, with dial graduations of 0.0001 in., show dimensions as measured over rolls on each of the three serrated sections. In addition, a computing indicator has been incorporated as a fourth indicator to compute automatically the difference between the amounts that each of two dimensions varies from its mean value. The inspected part is rejected whenever the computing indicator shows this variation to be greater than plus or minus 0.001 in. Furthermore, this two-point contact enables an inspector to explore any taper from end to end of the slots.

Two models of these air gaging units have been developed. The first is designed so that a grinding machine operator can gage the part while it is still in the grinding fixture. The second unit has been designed as a final inspection gage to check the finished part. *Taft-Peirce Mfg. Co.*

Circle E-14 on page 73 for more data



Taft-Peirce air-operated inspection gage for gas turbine blades.

NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

Small Truck Cab Heater with High Output

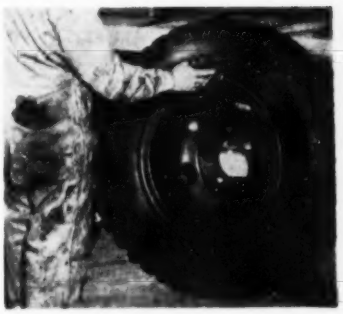
Recently introduced is a truck cab heater that is small in size but high in btu output. Designated as Model ED 75, the heater can be adapted either for recirculating or fresh air. It is already standard extra equipment on several makes of trucks.

Novel features of the 17,800-btu unit are: split core construction of tube and fin design; heavy cast brass tank that resists pulsation; threaded bosses for tubes that eliminate soldered connections and provide leak-proof connections; increased air delivery; five-blade 7½ in. diecast magnesium fan; and heavy-duty bus type motor designed for high efficiency.

Dimensions of the heater are 8 1/16 in. by 8 5/16 in. by 8⅝ in. Flat, space-saving duct work can be attached at bottom to bring fresh air in from outside the truck cab if a fresh-air installation is desired. Defroster air output at the windshield is 50 cfm. *Evans Products Co.*

Circle P-6 on page 73 for more data

Plastic Spray for Military Vehicles



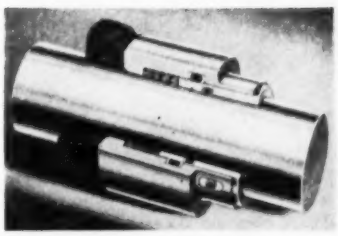
Currently being used to protect military tanks and other vehicles going into overseas shipment and storage is a sprayable plastic coating of the "cocoon" type. It is applied to seal off and waterproof such parts as radiator grills, tires, and seats.

It claimed that the storage life of tires is doubled when protected by the plastic coating. The coating is not removed from tires or seats when a vehicle is put in use. The plastic can be easily removed by stripping, but, in these two instances, it becomes a permanent coating, according to the maker.

The spray material is supplied in olive drab, blue, and yellow, so that it matches the color of the vehicle. *Industrial Div., R. M. Hollingshead Corp.*

Circle P-7 on page 73 for more data

Mechanical Seal for Rotating Pump Shafts



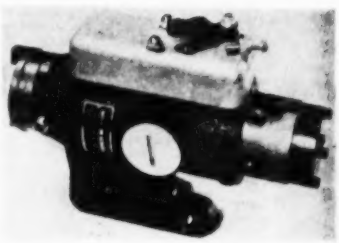
Now on the market is an "O" ring mechanical seal for rotating pump shafts which is said to withstand any mild, corrosive, or dangerous liquid.

The seals are furnished in Type O, an unbalanced seal for pressures up to 200 psi, and in Type OB (see cut), a balanced seal for pressures up to and over 1000 psi. Both types can be supplied with single spring or multiple spring, and in either pin-drive or sleeve-drive construction.

The "O" rings are available in Teflon, Buna-N, Neoprene, or Silicone. *The Garlock Packing Co.*

Circle P-8 on page 73 for more data

Fuel Injection Pump for Various Engines



Recently licensed for manufacture in the U. S. is the British Roosa-Master fuel injection pump. It is a single-cyl, opposed-plunger, inlet-metering, distributor-type unit.

The pump now is available for four, six or eight-cyl engines, and the design reportedly lends itself to applications on two and three-cyl engines as well. The pump can use either the existing engine governor or its built-in centrifugal (mechanical) governor or automotive (hydraulic) governor. *Hartford Machine Screw Co.*

Circle P-9 on page 73 for more data

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NEW PRODUCTS

For additional information, please use postage-free reply card on page 73

(*Continued from page* 71)

Air-Cooled Diesel Engine

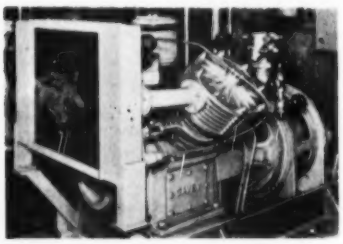
Currently in production is a two-cyl, air-cooled Diesel engine designated as Model AC-2. The four-stroke cycle unit has an output of 13 hp, continuous load, and 14 hp, intermittent speed.

The engine has a 3½ in. bore and 3¾ in. stroke. Displacement per cylinder is 36.07 cu in. Compression ratio is 20 to 1, and weight is 25 lb per horsepower. *Hallett Mfg. Co.*

Circle P-10 on page 73 for more data

Air Compressor

Recently announced for general industrial applications is a 25-hp stationary air compressor. Known as Model 25D, the unit has a displacement of 128 cfm. The electric motor is available with constant-speed or start-and-stop pushbutton controls.



Compressor is of V-type design with one 7⅜ in. low-pressure cylinder and a 4⅜ in. high-pressure cylinder. Stroke is 4½ in. Standard equipment includes intercooler with safety valve, air cleaners, air pressure regulator and unloaders, motor starter, and controls. *Davey Compressor Co.*

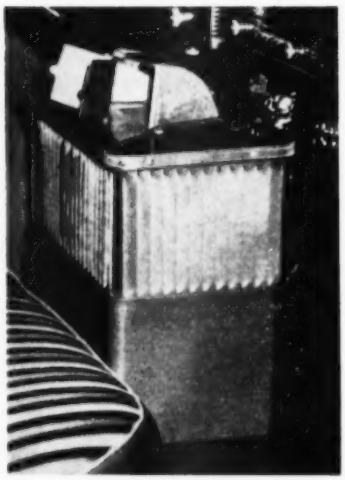
Circle P-11 on page 73 for more data

Air Conditioner

Now offered is a compact air conditioning unit for automobiles which is powered off the fan belt. Known as the Idler, it is an evaporative blower type unit which is said to be adjustable by a flick of the finger.

It is claimed that the unit is simple to install and requires no alterations to the car. It is reportedly adaptable to all standard U. S. and foreign makes of cars and trucks. *George Burney & Co., Inc.*

Circle P-12 on page 73 for more data



Pipe Coupler

Just announced is a coupler for an eight-in. pipe line. An optional valve in the coupler body is said to shut off the liquid flow automatically when the male part, or nipple, is removed.

Couplers are made from ¼ in. to eight in. In sizes up to three in. inclusive, the couplers are designed for screwed fittings, male or female, and over three in. with screwed or flanged fittings. *Snap-Tite, Inc.*

Circle P-13 on page 73 for more data

Brake Fluid Indicator

Recently announced is a brake fluid level indicator known as Ever Safe. Three sizes fit all cars and trucks.

The safety device forewarns the driver of low brake fluid supply by means of warning light mounted on the dash, and connected to a float unit switch easily installed in the car's master brake cylinder. The float unit simply replaces the master cylinder filler cap and is connected to the electric current supply and warning light. *Automotive Div., Wagner Electric Corp.*

Circle P-14 on page 73 for more data

Liquid Measuring Device

Recently developed is an ultrasonic instrument to aid precision quality control in a broad area of industry by streamlining processes involving fluid raw materials. Known as the Ultra-Viscoson, the unit measures and controls the viscosity of liquids by ultra-high-frequency sound waves.

Containing no moving parts, the device consists of a small sensing element, or probe, that is immersed in the liquid under test, and an electronic computer. The probe is designed

for permanent installation in a pipeline, kettle, or fractionating tower and, with the computer connected to a recorder, produces a curve of viscosity. *Bendix Aviation Corp.*

Circle P-15 on page 73 for more data

(*Turn to page* 162, *please*)

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FREE LITERATURE

Metal Hose

Catalog No. 200 describes a line of helically-wound and helically-corrugated flexible metal hose for varied applications. Featured in a special engineering data section are charts showing frictional losses versus flow rates for various sizes of metal hose and conduit. *Titeflex, Inc.*

Circle L-1 on postcard for free copy

Machine Tools

Now available is a booklet on machine tools and their role in the national economy, together with brief descriptions of the operations they perform. *National Machine Tool Builders Association.*

Circle L-2 on postcard for free copy

Industrial Trucks

Now available is a brochure describing a line of small, light industrial trucks, known as "walkies." *Edison Storage Battery Div., Thomas A. Edison, Inc.*

Circle L-3 on postcard for free copy

Quality Control

Recently released is a brochure which describes and illustrates how scientific quality control methods are applied to the manufacture of fine aluminum castings. *The Permold Co.*

Circle L-4 on postcard for free copy

Market Analysis

Recently published is a booklet entitled "Report to Exhibitors." Included are the findings of a complex study as to buying authority by functions of individuals in industry. It is based on an industrial exposition attendance survey. *American Society of Tool Engineers.*

Circle L-5 on postcard for free copy

Copper Corrosion

Recently released is a 28-page booklet (Publication B-36R) entitled "Corrosion Resistance of Copper and Copper Alloys" which explains the chemical and physical nature of corrosive attack in its various forms. *The American Brass Co.*

Circle L-6 on postcard for free copy

Mufflers

Catalog No. 151 describes a line of spiral mufflers with a self-cleaning feature. *Pratt Industries Div., Formed Tubes, Inc.*

Circle L-7 on postcard for free copy

Cutting Tools

Catalog No. 105 contains 176 pages with complete specifications on a line of cutting tools. Requests for copies should be made on company letterheads. *Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.*

(Please turn page)

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L-2	L-8	L-14	L-20	E-2	E-8	E-14	E-20	P-2	P-8	P-14	P-20	P-26
L-3	L-9	L-15	L-21	E-3	E-9	E-15	E-21	P-3	P-9	P-15	P-21	P-27
L-4	L-10	L-16	L-22	E-4	E-10	E-16	E-22	P-4	P-10	P-16	P-22	P-28
L-5	L-11	L-17	L-23	E-5	E-11	E-17	E-23	P-5	P-11	P-17	P-23	P-29
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Broaching Practice

Catalog No. 450, now available, is divided into two sections. The first thoroughly covers the theory and practice of broaching, while the second describes broaching machines and their applications. *American Broach & Machine Co.*

Circle L-8 on postcard for free copy

Pallet Loader

Currently available is a booklet on an automatic pallet loader for efficient materials handling. *Lamson Corp.*

Circle L-9 on postcard for free copy

Jet Parts Machines

Available for distribution is a bulletin describing a line of machines designed and built to work on jet engine parts. *Ex-Cello-O Corp.*

Circle L-10 on postcard for free copy

Combustion Gas Turbines

Now available is a 24-page booklet on combustion gas turbine power plants for mechanical drive applications. *Westinghouse Electric Corp.*

Circle L-11 on postcard for free copy

Pressure-Vacuum Gages

Catalog No. 7001 describes many types of pressure and vacuum gages used to measure vacuums as great as 10-11 mm of mercury and pressures as high as 150,000 psi. *Industrial Div., Minneapolis-Honeywell Regulator Co.*

Circle L-12 on postcard for free copy

USE THIS POSTCARD

Gear Generators

Bulletin No. T-455 describes a series of twin-head gear generators for gears which operate on parallel axis. *Farrel-Birmingham Co., Inc.*

Circle L-13 on postcard for free copy

Cylindrical Printer

Ready for distribution is a circular on the Cylindaprinter for printing around cans, canisters, and other cylindrical objects. *Adolph Gottscho, Inc.*

Circle L-14 on postcard for free copy

Castings

Catalog No. 53 covers the manufacturer's production facilities for a line of aluminum, magnesium, and bronze alloy castings in sand, semi-permanent, and permanent mold form. *Wellman Bronze & Aluminum Co.*

Circle L-15 on postcard for free copy

Milling Machine

Bulletin No. 1140 describes Model A-72 InvOmil profile milling machine for high spindle speed and high-feed non-ferrous metal milling. *Onsrud Machine Works, Inc.*

Circle L-16 on postcard for free copy

Motor Standards

Now available is a bulletin (GEA-5995) containing data on new NEMA motor standards. The standards set up new frame dimensions for a-c motors from one to 30 hp. *General Electric Co.*

Circle L-17 on postcard for free copy

Radial Drills

Fresh off the press is a 16-page booklet featuring the 11-in. column Mor-Speed radial drills. *Morris Machine Tool Co.*

Circle L-18 on postcard for free copy

Fork Truck

Currently available is a brochure on the operation of the Spacemaster fork truck. *Lewis-Shepard Co.*

Circle L-19 on postcard for free copy

Chain Sprockets

Catalog No. 53-110 covers a line of Rex cast and steel chain, cast tooth sprockets, belt conveyor idlers, and spray nozzles for designers of equipment using sprocket chains and power transmission machinery. A description of the manufacturer's facilities is also presented. *Chain Belt Co.*

Circle L-20 on postcard for free copy

Export Packing

Recently published is a 20-page booklet on export packing. It is intended as a guide to properly nailed wood containers for overseas shipments. *National Wooden Box Association.*

Circle L-21 on postcard for free copy

(*See preceding page*)

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L-4	L-10	L-16	L-22	E-4	E-10	E-16	E-22	P-4	P-10	P-16	P-22	P-28
L-5	L-11	L-17	L-23	E-5	E-11	E-17	E-23	P-5	P-11	P-17	P-23	P-29
L-6	L-12	L-18	L-24	E-6	E-12	E-18	E-24	P-6	P-12	P-18	P-24	P-30

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WHEN
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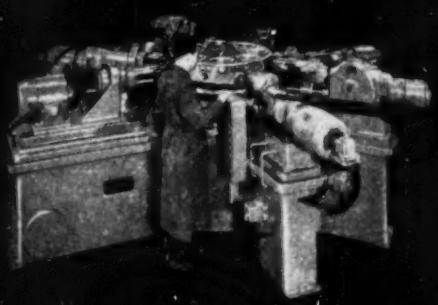

AUTOMATIC DRILLING & TAPPING MACHINES

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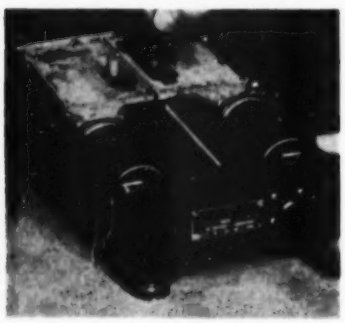
NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

Jet Ignition System

Development of a new capacitor-discharge ignition system for aircraft jet engines has been announced. Made up of lightweight components that are easily replaceable for maintenance, the new system reportedly will start jet engines at higher altitudes and lower temperatures than previously possible.



GE capacitor-discharge ignition system.

Said to be applicable to most jet powerplants, the new series of capacitor-discharge systems cover a variety of input and output power requirements. It is claimed that they provide constant spark energy at the plugs at altitudes over a 2:1 range of input voltage. *Aeronautic & Ordnance Systems Div., General Electric Co.*

Circle P-1 on page 73 for more data

Air Turbine Motor

Now in production is an air turbine motor with a variable area nozzle. Known as the ATM-50, it drives hydraulic pumps and constant speed d-c generators or alternators that formerly were driven by main engines in the aircraft.

The function of the nozzle is to adjust turbine torque automatically to power requirements. This reportedly reduces the air consumption of this type of throttling control.

The unit was developed to drive auxiliary power units at constant speeds, regardless of differences in electrical loads or air power supply. Variations of the basic design are rated from five to 150 hp, and they are said to operate on bleed air from auxiliary gas turbines or main engines. *AiResearch Manufacturing Co.*

Circle P-2 on page 73 for more data

Sequence Selector

Recently developed for the Air Force is a device which is said to enable an aircraft to take off, fly on a prescribed course to a given destination, and then land without a human hand touching the plane's controls.

Called an Automatic Master Sequence Selector (AMSS), it operates on the familiar punched-tape principle to program the functions of the autopilot and the air-speed control. When used with this other equipment, the "brain" forms a robot "pilot."

The "brain" takes over many of the duties normally performed by a human pilot by "memorizing" a flight plan from punched tape. Information from a myriad of instruments, sensors, computers and navigational aids is then converted into electrical impulses that go to the plane's autopilot and airspeed system. *Minneapolis-Honeywell Regulator Co.*

Circle P-3 on page 73, for more data

Honeywell sequence selector.

Heat-Sensitive Cable

A newly-developed cable, impervious to normal high temperatures but alert to the slightest touch of flame, has reportedly proved itself highly effective in minimizing aircraft fire hazards in tests under flying conditions of all types.

Edison cable installed in nacelle of B36 engine for testing purposes.

Constructed of a Thermistor material, the cable is said to function without electronic amplifiers and realarms as often as necessary, even after repeated exposure to flame of up to 2000 F. It is expected to save many lives and much costly equipment in military aircraft alone. *Thomas A. Edison, Inc.*

Circle P-4 on page 73 for more data

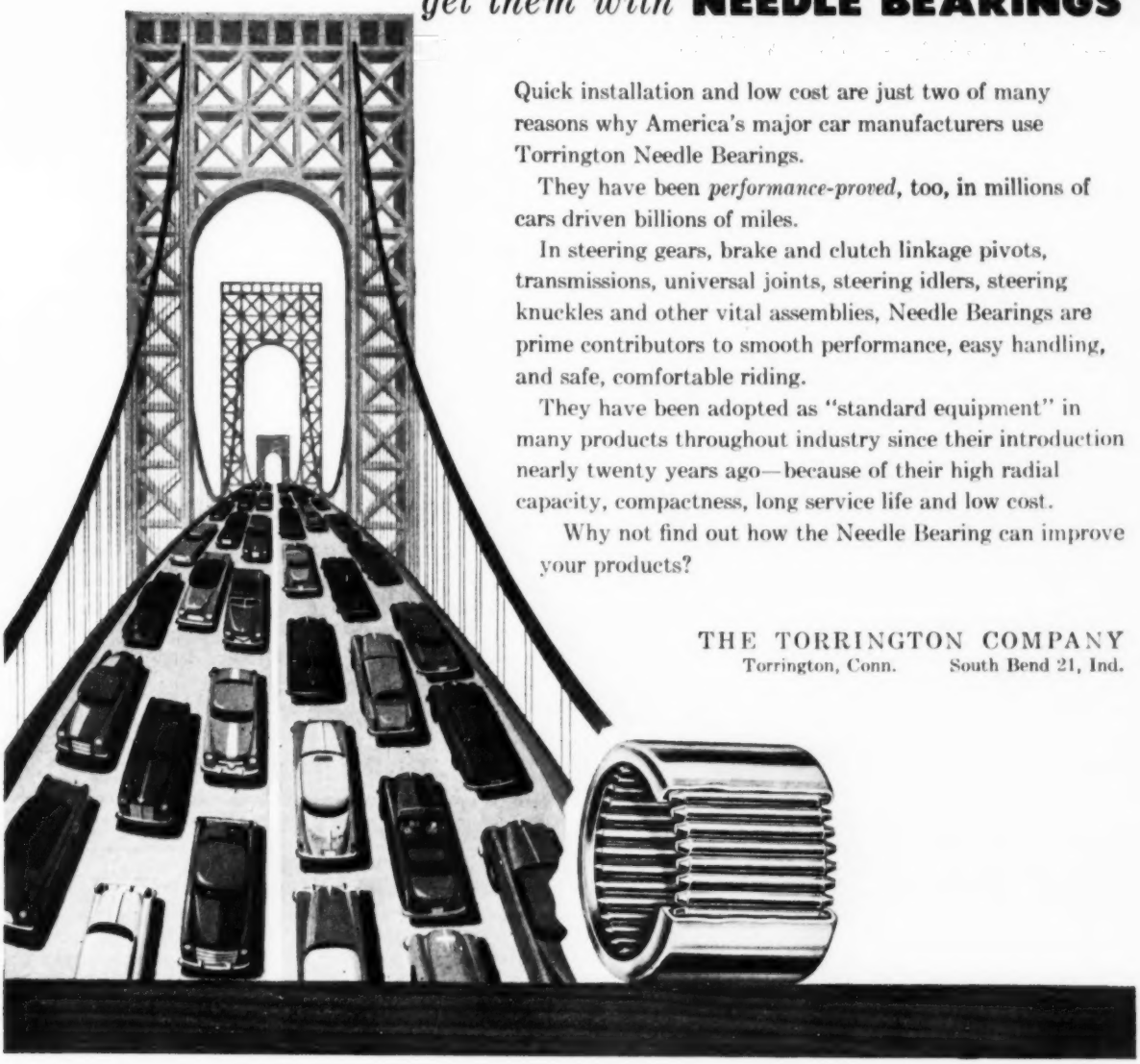
Lubricant

Recently announced is a grease consistency mixture for extreme bearing pressure lubrication at temperatures ranging from −40 F to approximately 400 F. Known as Molykote, Type U, it is said to be adaptable for use in extreme temperature applications in aircraft and has proven successful as a lubricant for rubber shaft seals rotating at speeds as high as 8000 rpm. *The Alpha Corp.*

Circle P-5 on page 73 for more data

Are Easy Assembly and Low Cost "Musts" for You?

Here's how leading automobile manufacturers get them with NEEDLE BEARINGS



Quick installation and low cost are just two of many reasons why America's major car manufacturers use Torrington Needle Bearings.

They have been *performance-proved*, too, in millions of cars driven billions of miles.

In steering gears, brake and clutch linkage pivots, transmissions, universal joints, steering idlers, steering knuckles and other vital assemblies, Needle Bearings are prime contributors to smooth performance, easy handling, and safe, comfortable riding.

They have been adopted as "standard equipment" in many products throughout industry since their introduction nearly twenty years ago—because of their high radial capacity, compactness, long service life and low cost.

Why not find out how the Needle Bearing can improve your products?

THE TORRINGTON COMPANY
Torrington, Conn. South Bend 21, Ind.

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

Trade Marks of 12 of the 18 passenger car manufacturers, all of whose cars enjoy the benefits of Needle Bearings.

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The BUSINESS PULSE

Although There Is a Possibility of Leveling Off in Some Industries, Many Imponderables Make Accurate Forecasts Impossible. Adjustment of Prices Puts End to Anticipatory Buying of Steel on Basis of Cost.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Growing Competition

As we move into the second half of the year, business activity is generally holding steady at high levels. Manpower, productive activity and resources by and large are fully employed. Evidence of growing competitiveness in some retail markets can be seen here and there. On the whole, though, the volume of consumption — buttressed by liberal use of instalment credit — is adjudged satisfactory by most analysts, and the rate of inventory accumulation is apparently being held within manageable proportions. The very large flow of income payments would seem to be assurance, in itself, of continuing good experience for several more months at least.

Despite this current buoyancy, a good many observers incline to the view that we are headed for lower levels of activity by the year's end. Indeed, as we pass the half-year mark, no topic is being more widely discussed in business circles than the possibility of recession.

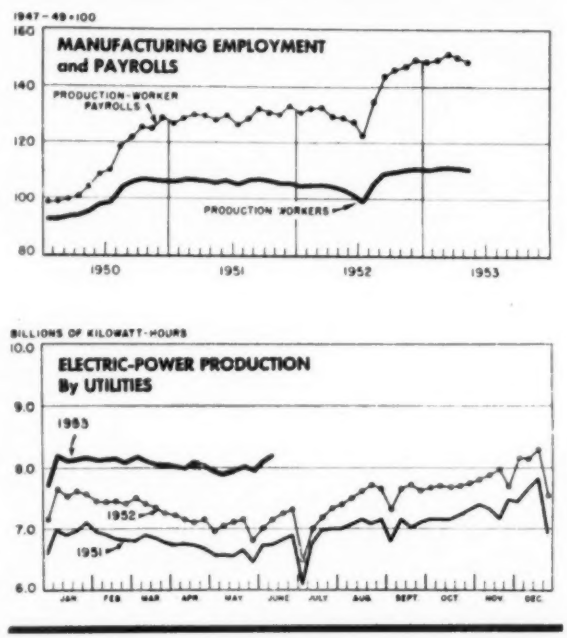
In a number of important industries there does appear to be a distinct possibility of some slackening within the next two or three quarters, to judge from present patterns. However, in an over-all sense there are too many imponderables overhanging the situation to justify much confidence in projected rates of activity. At home, very important questions relating to taxation and Federal expenditure are still unanswered. Abroad, the conditions that most strongly influence these matters are in a state of almost constant flux. It would be somewhat presumptuous, therefore, to speculate in any detail on the factors likely to be operative in the business situation six months hence.

Demand for Steel May Ease

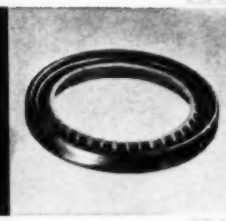
Steel is among those industries which are currently holding at near-record levels but which may ease up a bit by the fourth quarter. Following the settlement of the wage question and the subsequent advance in steel prices, steel markets grew perceptibly easier. On the one hand, elimination of the strike threat brought a termination of consumer efforts to build up inventories. At the same time, the upward adjustment in prices, which had been expected for some months, put an end to anticipatory buying based on price considerations. Recently there have been an increased number of blast-furnace shutdowns to permit repairs, and it

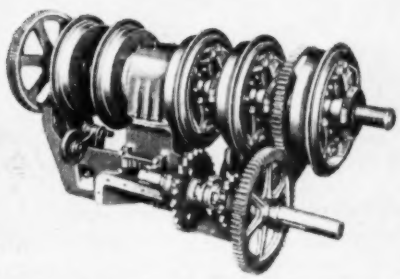
(*Turn to page* 114, *please*)

Selected Business Indicators



Source: U. S. Dept. of Commerce





SILASTIC*
Keeps Clutch Shaft Bevel Gears of Lorain TL-25's Bathed in Oil

Silastic lip seals look as good as new after more than 3 years of rugged service on the oil-filled clutch shaft bevel gear housing on the Thew-Lorain model TL power cranes and shovels. Conventional rubber seals failed frequently at operating temperatures in the range of 250°F. Silastic's long service life substantially reduces maintenance costs and production losses.

Performance proves...

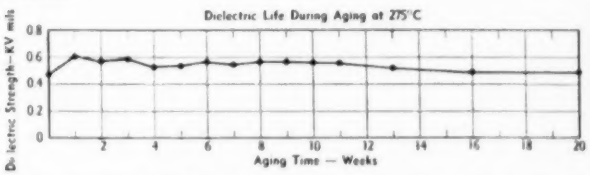
SILASTIC works

where other materials fail!

The turntable is the "guts" of a power crane or shovel, the part that makes the "wheels-go-round", where profit-making performance begins, so it's not surprising that Thew-Lorain put Silastic to work in the TL-25's, their newest idea in turntable design.

Silastic has been performance-proved in thousands of mechanical and electrical applications. It retains its rubbery properties at temperatures ranging from −70 to above 500°F; shows excellent resistance to shock, vibration, oxidation, weathering, and to a wide variety of hot oils and chemicals.

And Silastic stocks for electrical applications are unique even among silicone rubbers for low water absorption and retention of dielectric properties and high physical strength after long aging at Class H temperatures. Proof of the inherent stability of Silastic is given in the graph showing the effect of aging at 275°C (527°F) on the dielectric strength of Silastic.



When you need rubbery properties at temperatures above or below the limits of organic rubbers, or good dielectric properties in a resilient and flexible material, ***specify SILASTIC.***

MAIL COUPON TODAY FOR DATA ON THE PROPERTIES, PERFORMANCE AND APPLICATIONS OF SILASTIC.

DOW CORNING CORPORATION, Dept. C-7, Midland, Michigan

Please send me:

- ☐ Silastic Facts 1Ba, properties and applications of Silastic stocks and pastes.
- ☐ List of Silastic Fabricators.
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CHICAGO
CLEVELAND
DALLAS
DETROIT
LOS ANGELES
NEW YORK
WASHINGTON, D. C.
(Silver Spring, Md.)

Canada: Fiberglas Canada Ltd., Toronto • England: Midland Silicones Ltd., London

AIR BRIEFS

By ROBERT McLARREN

The Storm Strikes

The gathering budget clouds over U. S. Air Power have finally broken into the first positive economy move of the new Administration with cancellation of the Kaiser contract for Fairchild Packet and Chase Avitruc cargo airplanes. Kaiser had received both of these lucrative contracts under the Truman Administration and the Lovett "broaden the base" philosophy with a bare minimum of formality and satisfaction of eligibility requirements. Without criticism of the "second source" approach of the previous Air Force administration, the Kaiser price tag of $1,339,140 each for the Packet at a time when Fairchild, parent designer and producer of the airplane, is delivering them for $260,000 each is inescapably ridiculous. The close alliance of Kaiser and Chase Aircraft (Kaiser owns controlling interest), the unorthodox production arrangement under which Case is the prime contractor and Kaiser was to build the Avitruc at Willow Run as a subcontractor to Chase, and the indications of high cost combined to eliminate this program as well.

Kaiser Not Alone

Lest anyone suspect the new Administration guilty of Kaiserphobia, others are getting cancellation notices, too. Temco Aircraft, Dallas, Tex., lost its contract to build 160 McDonnell F3H Demon jet fighters, Beech Aircraft (together with Canadair, Ltd.) had their contract for production of the big Beech T-36A twin-engine transport-trainer cancelled, Piasecki lost 30 HUP-2 helicopters from its Navy contract and the 17-unit "heavy press" program has been slashed to only 10 presses. Under the new fiscal 1954 Air Force budget, a variety of slashes are included, although these are generally for aircraft not scheduled, including a number of transports and trainers (including helicopters) and a quantity of Boeing B-47 bombers intended primarily for assignment to training units.

Republic Wins Battle

It will be recalled that Republic Aviation Corp. led the fight for the maintenance of proprietary rights in American-designed aircraft to be produced abroad for NATO by foreign builders using U. S. funds. It now appears that Republic has won that fight with announcement that the Air Force has approved a Republic plan under which Republic, and not the Air Force or the Mutual Security Administration, will grant subcontracts to European manufacturers for its F-84 Thunderjet fighter used throughout the NATO Air Forces. The arrangements are being handled by Republic Aviation Corp.-International, a new company formed for the purpose. Other U. S. manufacturers whose products have been selected by NATO (Fairchild, North American) are expected to make a strong bid for the same arrangement. Under the old system, U. S. manufacturers—who had footed the bill for research, design and development costs—received nothing in return for production of their aircraft by foreign companies.

Boeing Jet Transport

Details are beginning to leak out on the Boeing 707 jet transport, which is scheduled for completion June, 1954. The 100-passenger jet airliner will have an empty weight of 92,000 lb. It will carry some 25,000 lb of payload and 72,000 lb of fuel, with its gross weight designed for 190,000 lb, making it the largest civil transport ever built in this country. The four P&W J57 turbojet engines will deliver 11,000 lb thrust each, giving the giant more power than even the contemplated deHavilland Comet III. The Model 707 will cruise at just under 600 mph, or substantially faster than even future Comets.

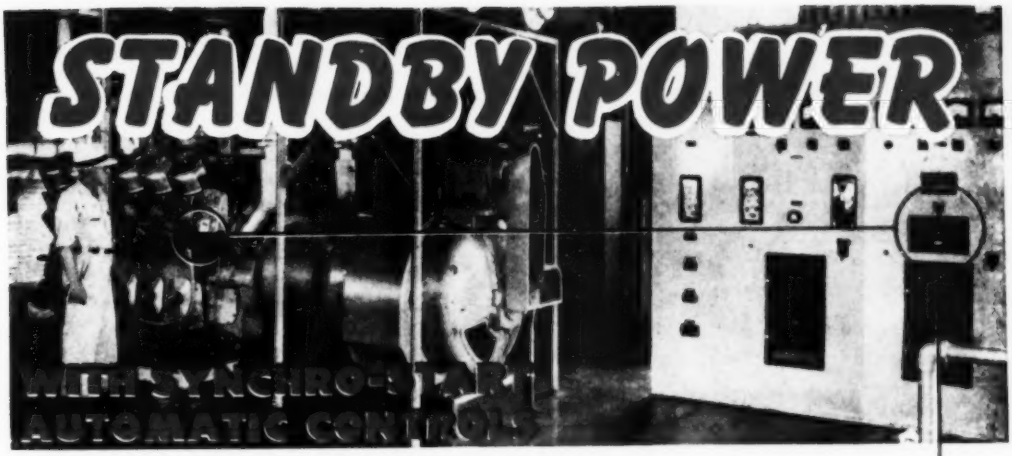
Convertible Airplane

Douglas Aircraft Co.'s new DC-6C answers the constant demand of the airlines for a combination passenger-cargo airplane that can be easily rearranged during a stopover. The new DC-6C can be varied from a 76-passenger liner to a 23,000-lb cargo plane through the use of folding seats, removable bulkheads, a complete pattern of cargo tie-down fittings throughout, and a removable food buffet and coat room. The proportion of passengers and cargo can be varied anywhere between the two extremes in a matter of hours.

Free Airplane

United Air Lines has informed its employees that if only 10 min of time can be saved in a single day in the scheduling of its transport fleet, that the aggregate saving would be the equivalent of an

(*Turn to page* 126, *please*)



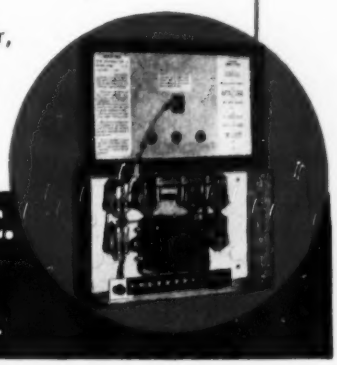
"Installation at LEBANON, OHIO, for the TEXAS EASTERN natural gas pipe line."

The need for automatic standby power has increased from year to year due to the vast savings they have afforded. Now, with the imminent possibility of bombing our cities and disrupting essential services, the need has greatly increased and deserves serious consideration by all power users.

For the past twenty years, SYNCHRO-START has made dependable controls to automatically start these power plants when power was required, and to stop them when power was no longer needed; also, to protect the power plants and their equipment from damage due to abnormal conditions while starting and running.

The above picture is typical of the many thousands of other SYNCHRO-START automatically controlled standby power plants that are in use throughout the world under every conceivable power requirement; on land, sea, in the air, and in the mines.

Contact your Architect, Engineering Firm, Engine Dealer, or Engine Manufacturer, for further information, or write us about your needs and our nearest representative.



SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

8151 N. RIDGEWAY AVE. • SKOKIE, ILL.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from page 23

British, German Vehicles Seen at Canadian Show

According to reports, only British and German vehicles were exhibited at the recent Canadian International Trade Fair. Morris passenger and sports cars and Volkswagen trucks and buses were displayed.

Cee-Bee Chemical Opens New Plant

Cee-Bee Chemical Co. recently opened a new plant and offices in Downey, Calif. The company was established in 1931 to serve the aviation and automotive industries with fine chemicals.

New Autocar N. C. Branch

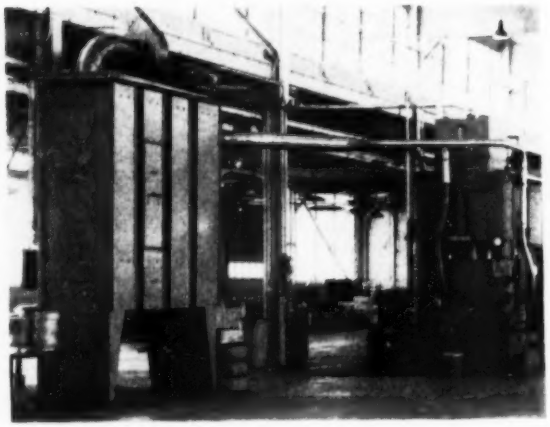
A new $200,000 sales and service headquarters has been opened by Autocar Co. for its branch in Charlotte, N. C. It has a total floor area of 16,600 sq ft.

Chrysler Enlarges Amplex Facilities

Recent installation of additional equipment at Chrysler Corp.'s Amplex Plant in Detroit has increased facilities for volume production of Oilite stainless steel products pressed from metal powder. Increased production has reportedly resulted in lower cost of the powder metal product and has opened it to many new fields of use.

Fulbright Scholar Named

Dr. P. H. Schweitzer, professor in charge of Diesel research, Department of Engineering Research, Pennsylvania State College, has been selected for a Fulbright grant to lecture and study research in Diesel engineering in Austria and other European countries during the academic year 1953-54. Besides Austria he expects to visit Great Britain, France, Germny, Holland, Switzerland, Italy, Denmark, Sweden and Norway.



MUCH CLEANER

Dustless operation in molding clutch plates is shown at Raybestos-Manhattan plant. Cloth-filter collectors were designed by American Wheelabrator & Equipment Corp.

Skilled Training Noted

Aircraft builders are giving on-the-job training to about 27,000 employes to reduce the continuing shortage of mechanics, machinists, and other skilled workers. Source of this information is Aircraft Industries Assn., which says this development of employe skills is going on in 86 aircraft plants.

AIA notes a growing need for diversified skills in the plane, engine, and parts fields. In 1946, it says, one firm made only piston engines and listed 2,432 separate jobs. Now the same company, building turbojet, ramjet, turboprop, and piston engines, has a list of 3,051 jobs.

Chrysler Expands Canadian Plant

It is reported that a $17 million plant expansion program, which will enable Chrysler Corp. of Canada, Ltd., to produce more than double its present output of passenger cars, has been started and will continue over the next two years. The program will include additions to the west and south sides of the passenger car plant, new loading and shipping facilities to handle stepped-up manufacturing output, a new transportation garage, and a building for experimental engineering facilities.

(*Turn to page 172, please*)

1953 MOTOR VEHICLE FACTORY SALES*

	Passenger Cars	Trucks	Buses	Totals 1953	Totals 1952
January	453,319	111,599	254	565,172	375,410
February	486,071	96,740	190	583,001	435,216
March	566,320	134,129	236	700,685	482,973
April	596,633	126,788	145	723,566	829,585
May	549,677	93,493	367	643,537	503,917
Total—Five Months	2,652,020	562,749	1,192	3,215,961	2,327,101

1953 MOTOR TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	53,077	21,481	4,087	16,333	3,950	8,766	3,905	111,599
February	45,121	18,279	3,413	13,305	4,287	8,255	4,080	96,740
March	59,951	25,153	6,159	22,962	5,618	9,503	4,783	134,129
April	55,652	25,680	5,770	21,005	5,187	8,856	4,638	126,788
May	43,812	16,293	3,580	13,379	4,823	7,900	3,706	93,493
Total—5 Mos. 1953	257,613	106,886	23,009	86,984	23,865	43,280	21,112	562,749
Total—5 Mos. 1952	194,756	100,645	29,370	111,236	26,139	48,479	21,855	532,480

* Automobile Manufacturers Association.

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90 Deg V-6 Engine

(*Continued from page* 44)

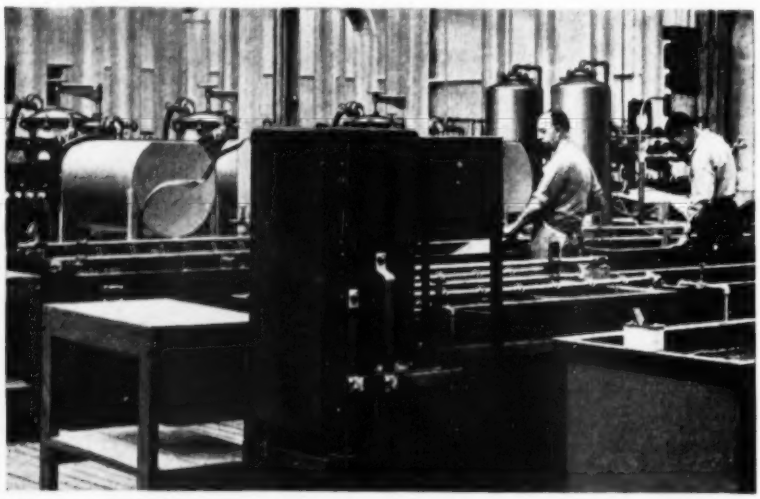
In general, a rocking couple at the forward end of the chassis is undesirable, as there is a possibility of its coming "into tune" with parts of the chassis. However, certain features of modern chassis design reduce the likelihood of its giving serious trouble. In the first place, all automobile engines are now mounted on rubber, and rubber possesses damping power or hysteresis, by which impulses which the engine tends to impart to the chassis can be damped out. The mountings would have to be designed to allow a certain freedom of motion in the transverse direction at both front and rear, and to have considerable damping effect. When cars were equipped with semi-elliptic front springs, the forward end of the chassis had a moderate degree of freedom of motion with respect to the front axle and wheels. In modern cars, in which the frame is connected to the steering head and wheels through parallel links, there is less such freedom. Moreover, the rubber bushings in these links should provide a slight additional damping action. It would seem that if there was sufficient damping effect in the so-called "Floating Power" mounting of the four-cylinder Plymouth car to prevent perceptible vibration at the critical speed, as was reported at the time, it should be possible to damp out transverse vibration in a 90-deg V-six due to the secondary rocking couple. As a further safeguard against such vibration the forward part of the chassis frame undoubtedly could be made more resistant to transverse deflecting forces than it is at present.

Effect on Drive Shafts

Whatever vibratory motion may be caused by the horizontal rocking couple will be of the nature of "shimmy," the forward end of the powerplant moving transversely in one direction while the rear end moves in the opposite direction. As the forward end of the propeller shaft connects to the rear end of the powerplant, the former participates in the motion of the latter, and the possible effect on the drive should be considered. It seems that with Hotchkiss drive no harmful effect need be expected. There is constant relative motion in the vertical direction between the powerplant and the axle, which is being taken care of by the universal joints, and with one such joint at each end of the propeller shaft, any relative transverse motion between the two units would be similarly taken care of. The connection between the propeller shaft and the powerplant evidently would not restrain transverse motion of the latter. With torque-tube drive, on the other hand, the connection of the rear-axle assembly to the powerplant would tend to restrain transverse vibratory motion of the latter, but it would also subject the torque tube and axle housing to additional stresses.

Use of Artificial Couple

If it should be found impossible to provide sufficient damping effect in the engine mounts to prevent per-



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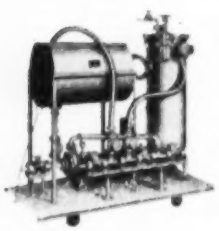
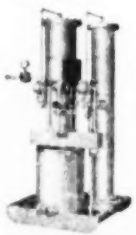


Standard INDUSTRIAL filters are available in capacities of 100 to 15,000 gph. Standard INDUSTRIAL demineralizers have capacities of 100 gph. up. Complete recommendations for any job upon request



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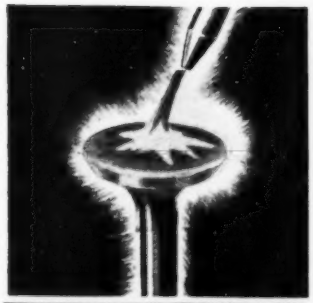
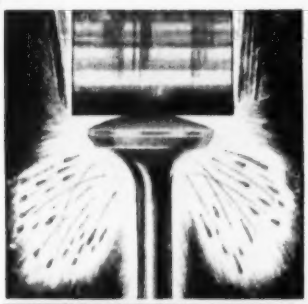


These facilities ...this special know-how



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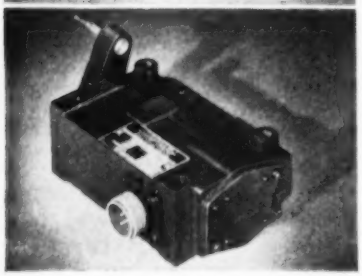

Airborne's geared magnetic brake is now available with an integral centrifugal brake to limit its speed and prevent overshooting. Designed to maintain any position within its travel range, the Model R-460 brake will hold a 200 lb. in. load, yet operate at less than 3 lb. in. when energized. A typical application is the centering adjustment of the bungee in the flight control system of a Piasecki Helicopter.

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ceptible vibration due to the transverse secondary rocking couple, there remains the possibility of neutralizing this couple by an artificial couple of opposite phase. Such a couple could be produced by a pair of unbalanced rotating masses at each end of the engine. The two masses of each pair would have to rotate in opposite directions, their axes would have to be equal distances above and below the level of the crankshaft axis, and they would have to rotate at twice crankshaft speed. As the secondary couple is only about one-fourth as large as the primary, as the balancing masses rotate at twice crankshaft speed, and as the centrifugal force varies as the square of the speed, the "unbalance" or moment required in each of the rotating masses would be relatively small.

Use of Gear Trains

It was shown in Fig. 2 that when the forward crank of a three-throw crankshaft is in the dead-center position with respect to the left-hand bank of cylinders, the resultant of the secondary inertia forces on the reciprocating parts in the two forward cylinders is a force acting horizontally toward the left. For this crank position the resultant secondary inertia force is at its maximum value. To neutralize it, the two rotating unbalanced masses at the forward end therefore must be so arranged that when the forward crank is in this position the centrifugal forces on them, which act along lines connecting their geometrical centers or axes with their respective centers of gravity, extend horizontally to the right, as shown in Fig. 3. The two gears of the forward pair, which are in mash with each other, are driven from a gear on the crankshaft through an intermediate gear. The gear on the crankshaft must have twice the number of teeth of each of the gears of the balancing pair, while the number of teeth of the intermediate gear is immaterial. At the rear end of the engine there would be a similar train of four gears, but the pair of balancing gears would be 180 deg out of phase with the pair at the forward end, so that when the centrifugal forces on the forward gears are directed toward the right, those on the rear gears are to the left.

It was stated in the foregoing that the maximum value of the horizontal secondary rocking couple of the six-cylinder, 90-deg V engine is $\sqrt{6}\,a\,y\,C$ lb-in., where C is the centrifugal force

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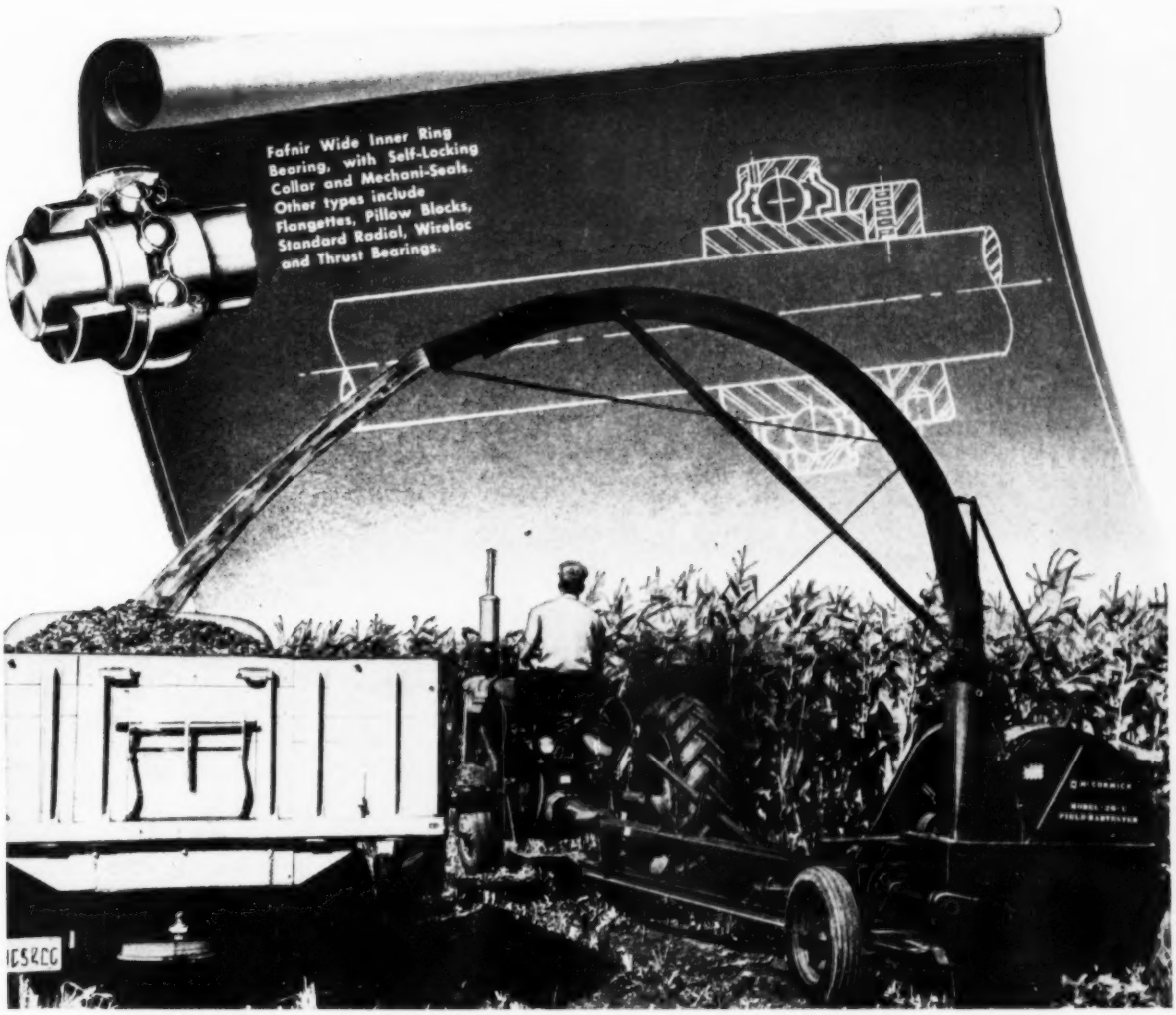
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International Harvester's new Model 20-C Field Harvester provides low-cost, flexible harvesting for forage or row crops

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produced if the reciprocating mass of one cylinder is rotated at crank radius with crankshaft speed. Denoting the reciprocating weight by W, the crank radius by R, and the crankshaft rpm by N, that force is $W\ R\ N^2/35240$ lb. Substituting this value of C in the expression for the rocking couple we get

$$C_r = \sqrt{6}\ a\ y\ W\ R\ N^2/35240 \text{ lb-in.}$$

The centrifugal force on each of the balancing gears is $w\ r\ (2N)^2/35240$, and that on the two gears combined therefore $8\ w\ r\ N^2/35240$ lb, where w is the unbalanced weight of each gear and r its distance from the gear axis. If the center distance between the gears at opposite ends of the engine is called l, the centrifugal forces on the gears produce a rocking couple whose maximum value is $8\ w\ r\ l\ N^2/35240$. This must be equal to the secondary rocking couple produced by the engine, hence

$$\frac{\sqrt{6}\ a\ y\ W\ R\ N^2}{35240} = \frac{8\ w\ r\ l\ N^2}{35240}$$

from which it folllows that $wr = 0.0248$ WR or WR/40.4.

If we take as an example an engine of 3.5 in. bore and stroke each, the reciprocating parts of one cylinder would weigh about 2.5 lb, and as the crank radius is 1.75 in., the value of WR is 4.375 lb-in. Therefore, the "unbalance" required in each of the rotating balancing masses (gears) would be $4.375/40.4 = 0.108$ lb-in. If the center of gravity of the unbalanced mass were, say 0.5 in. from the axis of rotation, the unbalanced mass required in each gear would be less than one-quarter lb. The bearing load on each gear due to the centrifugal force on it would be 196 lb.

Use of Heavier Flywheel

It may be well also to investigate the proportional increase in flywheel capacity required by a V-six in which power impulses are spaced 90 deg and 150 deg, as compared with a six-cylinder engine in which the spacing of impulses is uniform (120 deg). Fig. 4 is an "indicated-torque" diagram of a three-cylinder in-line engine, based on an indicator diagram showing an mep of 136 psi. To obtain torque diagrams for six-cylinder in-line and six-cylinder 90-deg V engines we combine two such diagrams with a phase difference of 120 deg in one case and 150 deg in the other. Fig. 5 shows the torque diagram of the six-in-line engine over a crank angle of 240 deg. As the torque cycle repeats itself every 120 deg of crank motion, the diagram naturally shows two complete, equal torque cycles. While in the three-cylinder engine the torque reverses during part of the cycle, in the six-cylinder in-line it always remains positive. As "indicated-torque" diagram for the six-cylinder, 90-deg V is shown in Fig. 6. Here the torque naturally has a wider range during the cycle, becoming negative during the interval of 150 deg between impulses. On each of the torque diagrams the mean value of the torque is indicated by a dash-dotted horizontal line. The area between the torque curve and the mean-torque line represents work done or energy supplied during the corresponding crank motion. Areas above the mean-torque line represent excess energy imparted by the burning gases to the pistons, resulting in acceleration of the crank motion, while areas below the mean-torque line represent energy supplied to the crankshaft by the flywheel from its store of kinetic energy. In order that the speed fluctuations may be the same in the 90-deg V-six as in the in-line six, the flywheel ca-

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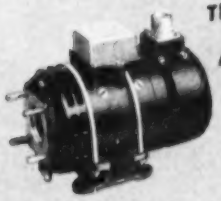

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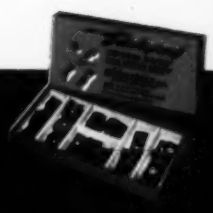

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pacity of the former must bear to that of the latter the same proportion as one of the large areas above or below the mean torque line for the V engine to the corresponding area in the torque diagram for the in-line engine. As the vertical scale is in lb-ft and the horizontal scale in deg, the area under the curve represents lb-ft-deg. One lb-ft acting through one radian is equal to 1 ft-lb of energy or work, and as one radian is equal to 57.3 deg, 57.3 lb-ft-deg is equal to one ft-lb. Measurement of the areas and conversion into ft-lb shows that during each torque cycle the flywheel of the six-cylinder in-line engine has to furnish about 115 ft-lb of energy and that of the six-cylinder 90-deg V, 191 ft-lb. Hence the 90-deg V engine would require 66 per cent more flywheel capacity if the speed fluctuations were to be the same in both engines. The additional flywheel weight probably would not exceed the saving in weight on the crankcase, crankshaft and camshaft, as compared with the in-line six, so that the total engine weight should be no greater; but the greater flywheel capacity would reduce the response of the engine to the throttle.

BOOKS . . .

ENGINEERING MANUFACTURING METHODS, *by Gilbert S. Schaller, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y. Price, $7.00.* Engineering industry is continuing the trend toward specialization in its endeavor to produce a quality end product at a satisfactory cost. This challenging objective poses the vital problem of material selection coupled with economical manufacturing methods to every level of the industrial organization. Decisions on these fundamentals are no longer the province of any one department; rather, they are best reached by the combined thinking of the entire organization. Considered judgment combined with open-mindedness are requisites to correct decisions. This text is intended to provide a survey of engineering manufacturing methods in a manner that will afford some insight into their potentialities. The selection of the best method or the most efficient machine tool for a specific undertaking should result from the evaluation of all pertinent factors. Light metals are given attention commensurate with their increasing importance in engineering manufacture. Foundry subjects are approached from the viewpoint of the production of economical quality castings. The chapters on welding are of such scope as to include all the salient features of this pertinent phase of manufacturing methods. Emphasis in the treatment of machining is placed on fundamentals with special attention to those machine tools and methods that are of widest usage.

Production Pointers from GISHOLT

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Presented as a service to machine shops, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your metal work.

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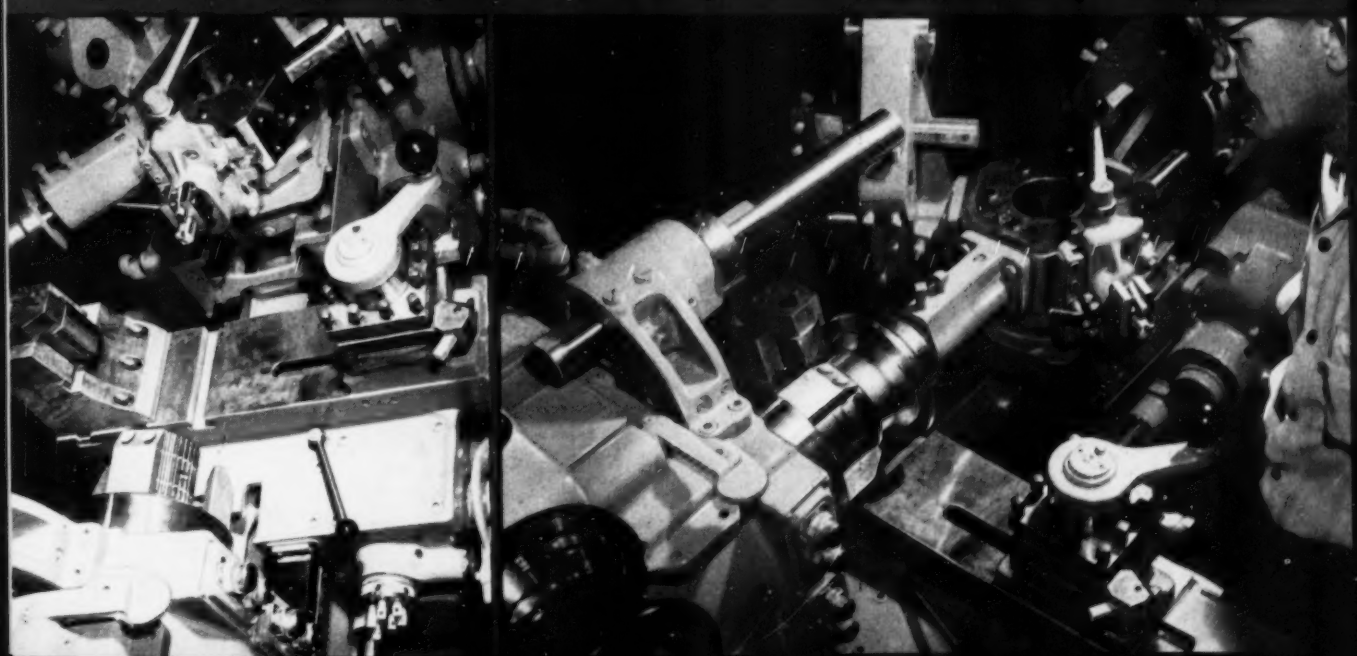
Centering and Holding Simplified by Splined I. D.

This user solved several problems at once . . . by the application of a splined arbor to chuck these steel shaft couplings for turbine rotors. This method provides the firm holding needed for a heavy forming cut, taper boring and other machining. The machine is a Gisholt No. 4 Ram Type Turret Lathe.

The workpiece is slipped on the arbor against three stops. The splined arbor has a center section that rotates slightly, locking the two splined surfaces snugly to eliminate all play. The heavy forming cut is done with a dovetail forming tool on the rear of the cross slide. During this cut the workpiece is supported with a live center mounted on the hexagon turret.

The taper attachment is placed on the front of the cross slide carriage and bores the conical inside surface with the cutter in the square turret. The balance of machining is conventional and is done by tools on the hexagon and square turrets.

On this tough steel workpiece, the tolerances are close, a lot of chips are made . . . yet the No. 4 Ram Type Lathe does the job in only 10.7 minutes, f.t.f.



GISHOLT

TIME-SAVING IDEAS

SMART CHUCKING AND TOOLING COMBINE TO CUT COSTS

DANLY Handles 32 Different Parts on ONE Simplimatic

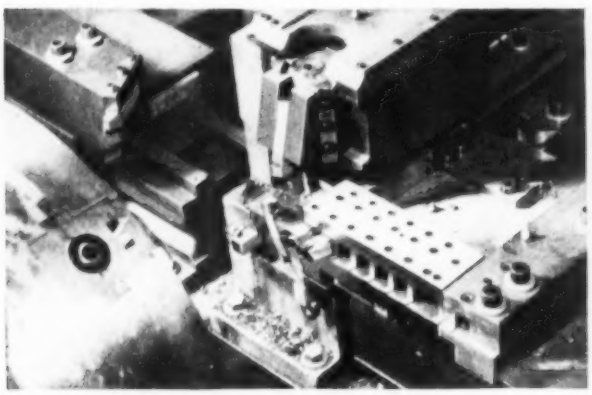
High production of 32 different parts on *one* machine is a neat trick to cut costs—if you can do it . . . particularly when you have square and rectangular shapes to chuck. But Danly Machine Specialties, Inc., largest producer of die maker supplies, is doing it.

The job is machining punch holders . . . and the machine is a 4D Simplimatic Automatic Lathe. The problem of chucking the 32 different sizes was solved by a duplex chuck having two pairs of self-centering jaws which work independently of each other.

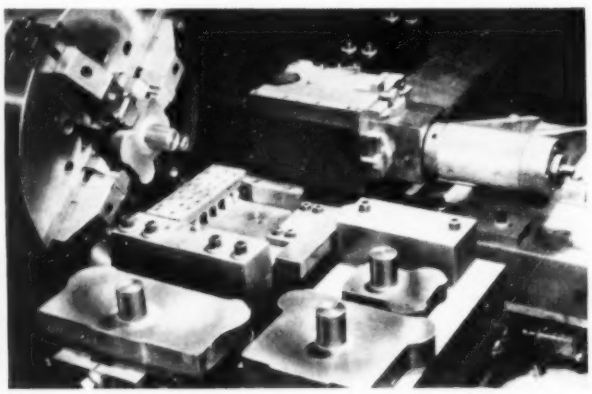
An important aid to production is the front slide with provision for adding tools to accommodate tool travel on the various size workpieces. All 32 types of punch holders are handled simply by inserting or removing tools as necessary.

For the finishing operation, the Simplimatic has a variable speed motor. As the rear slide tool approaches the hub and the diameter diminishes, spindle speed increases. Thus, cutting speed is essentially the same for the entire face of the workpiece.

In this interesting setup, 32 different size parts are handled simply by repositioning chuck jaws and adding tools to the front slide.



Jaws of chuck operate in pairs to center parts. Note typical workpieces in foreground.



Tooling for machining steel punch holders. Time for workpiece with this setup is only 2.33 minutes.

VALVE BODY PRODUCTION . . . *ON THE DOUBLE*

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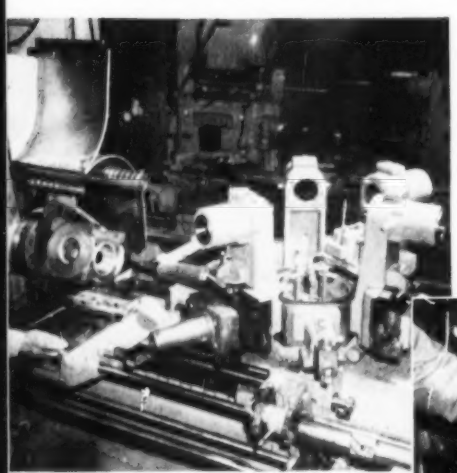
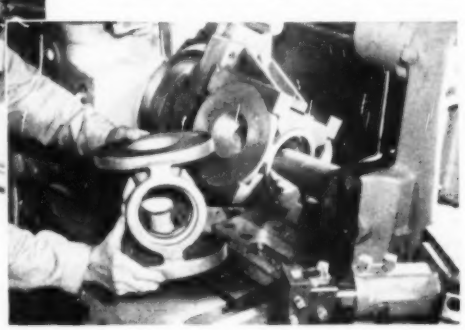


▲ 2F Fastermatic tooled to machine variety of valve bodies.

Operator holding typical valve body. Note cam-guided boring tool, slide-mounted, on hexagon turret. ▶



Note how this user machines both cast iron and steel plug valves, in a variety of sizes, with this Gisholt 2F Fastermatic Automatic Turret Lathe. The first turret station has a loading arbor to carry the workpiece into proper position for chucking.

Five or six hexagon turret stations are used, depending on the kind of valve body being machined. The tapered seat for the plug is rough and finish bored with single, horizontal slide tools mounted on the hexagon turret. These are guided by an angular cam on the cross slide and held tightly against the cam by sustained air pressure.

In addition to the taper bore for the valve plug, there is boring, facing, and on some workpieces, grooving. Floor-to-floor time for the 2″ valve body shown is 11.5 minutes. A single operator easily handles two machines.

The internal taper diameters of these plug valves are bored with repetitive accuracy and finish by cam-controlled single point tools, rather than the usual reamers.

GISHOLT

TIME-SAVING IDEAS

FOUR OPERATIONS ON TWO PIECES WITH SIMPLE CHANGEOVER

Shows Versatility and Speed of No. 12 Hydraulic Lathe

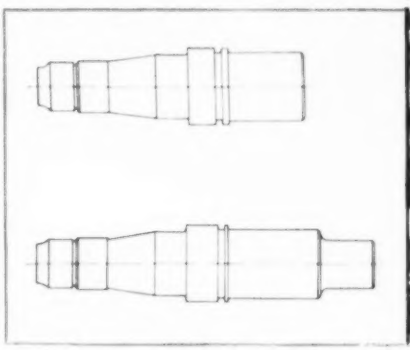
Two different workpieces, each requiring machining on both ends, are handled here with fast, easy changeover. The parts are suspension spindles of nearly equal diameter, but of different lengths. The Gisholt No. 12 Hydraulic Automatic Lathe is the machine handling both.

The parts are held between centers and rotated by an automatic workdriver. Variation in the lengths of the two workpieces is provided for by the use of different tailstock centers. By this method the rear independent slide always remains in the same position—minimizing changeover time. Extra dwell for the rear independent slide tools is obtained through an adjustable stop-block. This is screw mounted on the slide and actuates a switch that starts a timer. The timer operates through the main control valve, returning the slide at the end of the timer cycle.

All turning operations on either end of both workpieces are done from the front carriage. Tools on the rear independent slide handle all grooving, facing and chamfering. Time for the first operation on both spindles is 1.60 minutes. For the second operation, floor-to-floor time is 2.00 minutes for both workpieces.

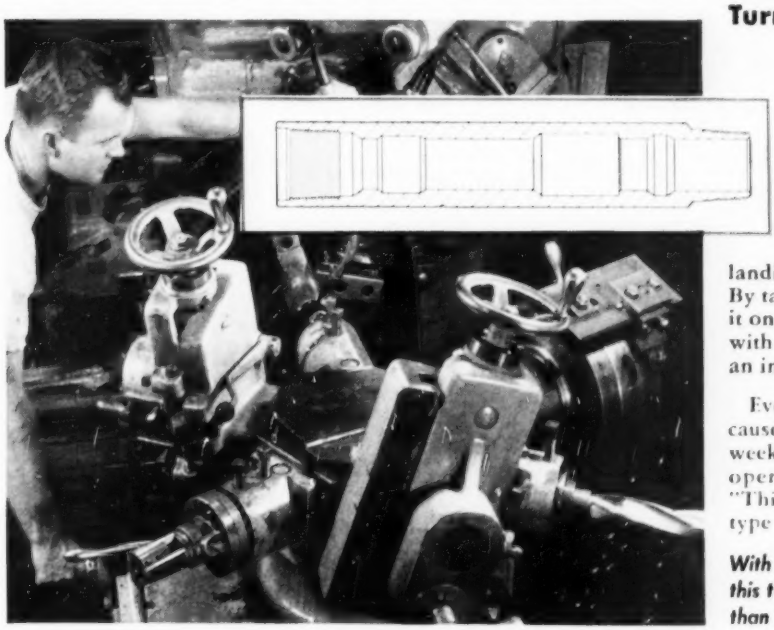
Here's an example of fast, automatic production, with simple changeover on two different parts of varying lengths.

First operation setup for small spindle. Second operation has similar machining on both size spindles.



SIMPLE SWITCH BOOSTS PRODUCTION 50%

Turret Lathe Brings More Tools to Bear on Work



Setup that increased output 50%

One tool at a time is fine . . . up to a point. When you begin to get into a variety of surfaces, such as here, it's time to change.

That's exactly what Otis Engineering Corporation, Dallas, Texas, did in the machining of these stainless steel landing nipples used in deep oil-well work. By taking the job off an old lathe and putting it on a modern Gisholt 2L Saddle Type Lathe with multiple tooling, they were able to make an immediate production increase of 50%.

Everybody is happy about it: The firm, because the machine gives a full 95 hours per week of *lower-cost* production—and the operator, Richard N. Crawford, who says, "This is one of the best turret lathes of any type I've ever operated."

With all stations of the hexagon turret working, this two-operation job is completed 50% faster than by old method.

GISHOLT

TIME-SAVING IDEAS

SOLVED: A WEIGHTY BALANCING PROBLEM

5-Ton Turbine Rotors Corrected to Accuracy of 2 Ounce-Inches

De Laval Steam Turbine Company, Trenton, N. J., had a three-fold problem in balancing these large marine turbine rotors:

1. Accurate balancing
2. Correction at a rapid rate
3. Prevent scoring of journals

By dropping an older method and doing the job on a Gisholt DYNETRIC Balancer, De Laval answered all three requirements with one machine. The 16-stage rotors weigh 10,000 lbs. and measure 95" in length and 70" in diameter.

The balancing and correction functions are tied together. The rotors are balanced to an accuracy of 2 ounce-inches by making correction on two balance rings: On one, excess metal is ground off the heavy side. On the other, where it is not possible to remove material, correction is made by adding plugs of predetermined weight to tapped holes.

In the former balancing method, journals were scored as a result of being carried on rollers. This made it necessary to refinish the journals after balancing. The Gisholt Balancer ended this trouble because the workpiece is properly carried on half bearings.

As to the performance of the Gisholt Balancing Machine, the manufacturer reports, "This Gisholt Balancer replaces one of another type. We now have a safer and faster operation to give us the accuracy we require. The half bearings in the work support have eliminated the scoring of journals."

Faster, more accurate balancing of rotors by this Gisholt DYNETRIC Balancer pays off in smooth, vibrationless operation, longer life.

THE GISHOLT BALANCING SCHOOL *teaches the supervisor to plan for faster setups, quicker changeover, and how to get more out of balancing equipment in every way. Write for information. Classes now in session.*

DYNETRIC BALANCERS

SUPERFINISHING IMPROVES QUALITY OF TRANSMISSION PARTS

Faster, Less Costly Than Former Process

How to achieve fine finish on these high-quality automatic transmission parts? This manufacturer turned to Superfinish—for speed, efficiency and low cost.

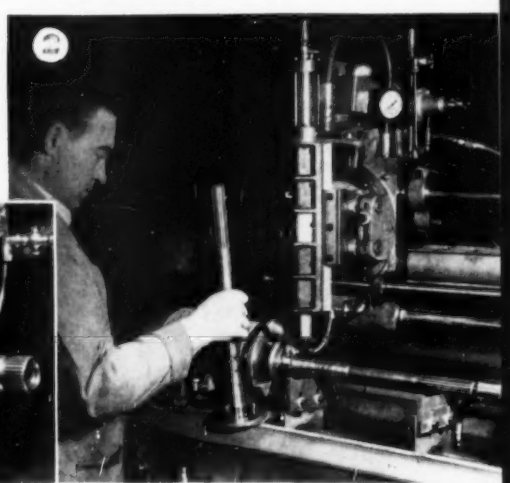
Here's how it's done:

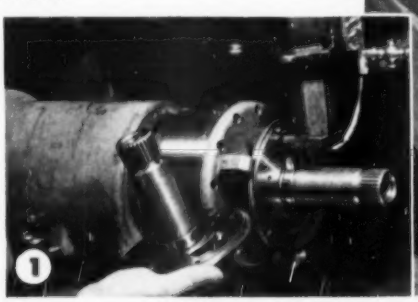
First photo shows a flanged hub in the Gisholt 52-A Superfinisher. To hold the assembly, the chuck is mounted on a special face plate. The Superfinish Stone-Carrying Quill has extra travel to provide clearance for easy loading and unloading. For Superfinishing the bearing surfaces, two speeds are used—a 10-second roughing cycle and a 15-second finishing cycle. Except for the loading and removing of parts, the machine is fully automatic with a predetermined and adjustable cycle.

To do the shafts shown in the second photo, changeover is this quick and easy: The chuck is removed, and a standard driving plate is mounted on the spindle. Loading of the longer workpiece is aided by two adjustable loading rails. The workpiece is held between a headstock dead center and a tailstock live center.

Superfinishing cycle-time is the same for both parts. Production is at the rate of 70 per hour at 80% efficiency. In both cases, bearing surfaces are Superfinished to 3 to 4 micro inches R.M.S. from a ground finish of 15 to 20 micro inches R.M.S.

In one fast, automatic operation, Superfinish rids vital bearing surfaces of smear metal, grinder flats, etc., to insure smoother, longer life. Here's not only low production cost, but also low machine investment.





No. 7-853
613

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Write for your copy of Gisholt's new general catalog.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Saginaw Linkage Type Power Steering

(*Continued from page 32*)

The linkage booster unit consists essentially of a power cylinder, control valve, and end housing with an axially movable shaft for actuating the control valve. The booster is mounted to the steering arm of a center-point or fore-and-aft linkage by means of the end housing and to a fixed member of the frame at the piston rod end. The steering gear is linked to the booster through a connecting rod running from the pitman arm to the actuating shaft.

A brief description of the functioning of this unit is as follows:

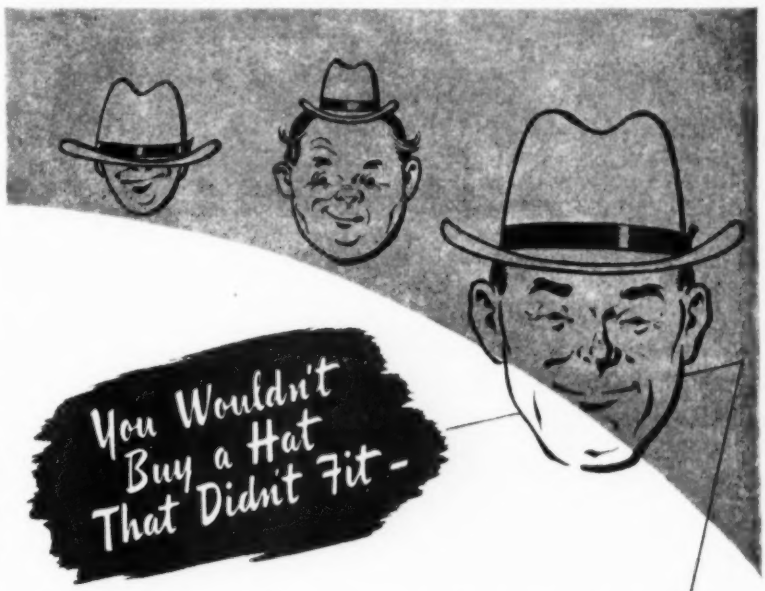
When the system is in neutral position fluid from the pump enters the pressure port, travels through the narrow gaps between the valve housing and spool members, and exists through the end annular grooves which terminate at a single return port.

In negotiating left turn, the actuating shaft is moved toward the cylinder through the pitman arm and connecting rod as shown in the sectional illustration. This relative movement takes place due to the resistance of the outer portion of the booster to movement. The movement of the shaft and hence the spool member causes closure of the right pressure gap and the left return gap. Fluid, therefore, will be forced into the left cylinder passageway and through the annular passageway formed by the inner and intermediate cylinder tubes to the rod side of the cylinder. As soon as enough pressure has been built up against the piston to cause movement, such movement will occur and the outer members of the booster will move, tending to neutralize the unit. This movement necessarily causes the linkage and wheels to move. As long as the handwheel is turned the outer portions of the booster will always be attempting to catch up with the inner members and the power steering will be functioning.

Steering in the opposite direction causes a like functioning of the valve, except that fluid is now directed to the rear or non-rod side of the piston.

The centering springs, acting through thrust washers on both ends of the valve, tend to keep the spool in its neutral position and must be overcome before the power steering comes into play. Once the valve is offset and pressure commences to build up, the pressure acts upon the differential area of the larger outer lands of the spool over that of the inner smaller lands. This pressure tends to help the appropriate spring neutralize the valve. Hydraulic centering force is therefore proportional to the pressure being built, which, in turn, is proportional to resistance to turning. It is through this device that the "feel" of manual steering is retained.

The space between the intermediate and outer tubes of the cylinder communicates with the space behind the piston rod seal as well as the space between the actuating shaft locknut and a ball check valve. Any fluid which leaks through the piston rod bearing is therefore conducted to the area through the ball check valve, and is injected back into the system when the pressure of this fluid exceeds the back pressure of the system. This injection occurs during the



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Technical Service Data Sheet
Subject: *GRANODIZING** FOR LONG PAINT LIFE ON STEEL

"GRANODINE" FORMS A DURABLE PAINT BOND

Granodizing forms a crystalline, zinc phosphate coating on steel. This ACP paint-bonding process chemically changes the surface of steel into an inert non-metallic coating made up of thousands of microscopic zinc phosphate crystals.

Granodized steel thus presents a surface much more receptive to paint than untreated steel. Its crystalline structure permits a firm and durable "keying" or bonding of the paint finish. And the "Granodine" zinc phosphate coating itself is actually integral with the metal from which it is formed.

"GRANODINE" CAN BE APPLIED BY DIPPING, SPRAYING OR BRUSHING

Granodizing can be accomplished by:

1 Dipping the work in tanks;
2 Spraying the parts in a power washer; or
3 Brushing, spraying, or flow-coating the work with portable hand equipment.

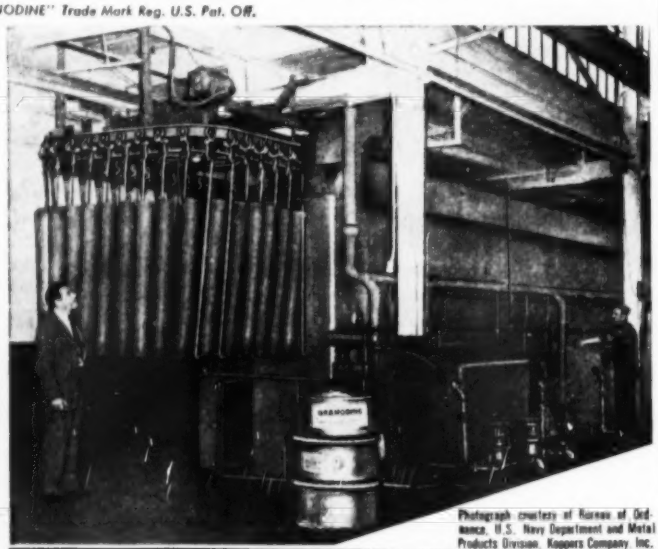
Choice of process is usually decided by such factors as the size, nature, and volume of production.

"GRANODINE" STANDARD PRACTICE ON BOTH CIVILIAN AND MILITARY PRODUCTS

Automobile bodies and sheet metal parts, refrigerators, washing machines, cabinets, etc.; projectiles, rockets, bombs, tanks, trucks, jeeps, containers for small arms, cartridge tanks, 5-gallon gasoline containers, vehicular sheet metal, steel drums and, in general, products constructed of cold-rolled steel in large and continuous production are typical of the many products whose paint finish is protected by "Granodine".

In military production, "Granodine" is used to obtain a zinc phosphate finish meeting Grade I of JAN-C-490 and equivalent requirements of other specifications.

*"GRANODINE" Trade Mark Reg. U.S. Pat. Off.



Photograph courtesy of Bureau of Ordnance, U.S. Navy Department and Metal Products Division, Koppers Company, Inc.

Typical power spray washing machine for the automatic application of a protective phosphate coating to metal parts in preparation for painting. These 5" rocket motor tubes, as well as products made of cold rolled sheet steel, are effectively phosphate coated in such equipment.

CHEMICALS ACP PROCESSES

"off" cycle of the non-rod side. During the high pressure cycle the pressure in the system keeps the ball closed, but the rod side and hence the seal is again subjected only to back pressure. The seal, therefore, is subjected only to the low back pressure of the system.

A nylon scraper-wiper combination is placed outside of the seal and around the piston rod to prevent dirt from wearing the seal.

BOOKS . . .

GLYCEROL (ACS MONOGRAPH NO. 117), *edited by Carl S. Miner and N. N. Dalton, published by Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. Price, $12.00.* Written and edited by leading research scientists under the sponsorship of the Glycerine Producer's Association of America, this book provides complete information on the sources, recovery, refining, and uses of Glycerol. All of the important recent developments in the field —synthetic glycerol, purification by ion exchange, and many others—together with latest designs in equipment, are fully discussed. Especially useful to chemists, purchasing agents, and executives is the complete chapter on standards and specifications. This chapter, as well as those on analysis, physical and chemical properties, offers latest available data in easy-to-read tabular form. The uses of glycerine, ever increasing both in number and in domestic and industrial importance, are fully described to point out a great variety of present-day applications.

PROCEEDINGS OF THE THIRTY-FIRST ANNUAL MEETING OF HIGHWAY RESEARCH BOARD, *published by Highway Research Board, Division of Engineering and Industrial Research, National Research Council, Washington, D. C. Price, $7.50.* This volume is a compendium of papers presented at the Thirty-first Annual Meeting of the Highway Research Board, held January 15 to 18, 1952, in Washington. Among the highway problems extensively covered are those involving: economics, finance, and administration; design; materials and construction; maintenance; traffic and operations; and soils.

PLANT LOCATION, *by Leonard Yaseen, published by Business Reports, Inc., 225 West 34th St., New York, N. Y. Price, $12.50.* This book contains an authoritative and practical presentation of the factors influencing scientific location of new plant facilities in an era in which there are rapid population shifts, growth in numbers, changes in age brackets, and shifts in location and skills. Shifting markets, mounting freight costs, the need for new labor pools, and advancements in training techniques are but a few factors which have stimulated the vast decentralization of industry. The author shows why and how to make a study of raw materials-sources, the manner in which they are processed, the people and skills needed to do that job—and the buying habits and locational concentration of the people who use the product. Against this picture prospective locations are evaluated in terms of costs for materials, labor, utilities, taxes, and distribution to the market. The objective is the scientific determination of that one best community which offers the greatest competitive advantage for a specific manufacturing operation.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Gemmer Linkage Type Power Steering

(*Continued from page* 33)

outboard bearing at the left. At the same time this arrangement serves to maintain a positive position of the valve, as well as to prevent rotation.

Because of the vulnerable location of the linkage, the piston rods are of massive construction, relatively, with sufficient rigidity to resist bending or distortion. Similarly, the cylinder is sufficiently massive to prevent impairment of operation by becoming dented. It will be further noted that vital points such as the piston connections at each end, the outboard bearing, and the outer portion of the ball joint, all are suitably protected with rubber boots.

Figure 3 shows a cross-section through the valve system, indicating the flow of pressure fluid for a given maneuver. Among the noteworthy features listed by Hammond are: that the valve is free of any forces except those employed for valve actuation; that cylinder action arises from balanced power piston areas, thus avoiding any unbalanced forces that may tend to "steer" the car from a desired course. As illustrated, the valve unit is mounted symmetrically in the center of the assembly, joining the two sections of the cylinder assembly.

It is obvious in studying the illustrations that in the Hydraguide linkage system the entire unit is held securely in one position, the movement for actuating the connections to the wheels resulting from a displacement of the central cylinder.

Hammond pointed out a unique characteristic of a linkage booster system; the fact that the valve mechanism is actuated only after the initiating signal from the driver has been transmitted through the manual steering reduction. Consequently, the recovery forces urging the steering system to assume its normal attitude on the road must cause the manual steering gear to return to its correct position. This implies that recovery forces must operate through the control valve before it can overcome the friction and inertia of manual gear parts as well as the inertia of the steering wheel.

Since these resistance forces cause the control valve to operate in reverse direction, i.e., to resist recovery, it becomes desirable to have high reverse efficiency in the manual steering gear and low inertia in the steering wheel.

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By using an ordinary nut and bolt to carry the load—plus a PALNUT Lock Nut on top to keep it tight—you have a completely vibration-proof, rugged assembly which stays trouble-free in severest service. Widely used on automotive, electrical and heavy machinery and equipment of all types, with distinct advantages over lock washers, jam nuts, cotter pins and self-retaining nuts.

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Connecting rods, main bearings, engine mountings, brake parts, body hold down, shock absorber mounting, transmission housing, etc.

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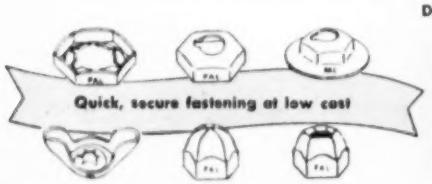

PALNUT TRADEMARK LOCK NUTS

BOOKS . . .

ASTM STANDARDS ON LIGHT METALS AND ALLOYS, *published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $3.00.* This special 216-page compilation gives the numerous specifications and tests issued by the American Society for Testing Materials through March, 1953. In addition to the recommended codification, there are groups of specifications for aluminum and aluminum-base ingots, castings, bars, rods, wire and shapes, forgings, pipe and tubes, sheet and plate. Specifications for wrought products for electrical purposes include those for bars, various types of electrical conductors, wire, etc.; also a test for resistivity. There are two specifications for filler metal-electrodes and brazing material; and the recommended practice for electroplating is given. In the field of magnesium and magnesium-base alloys there are standard requirements also for ingots, castings, bars, rods, and shapes, forgings, sheet and tubes. There are seven general test methods covering these light alloys, which include dielectric strength, weight of coating, measuring of thickness, tension testing, and sampling.

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Bendix Magneto Ignition is an independent, self-sufficient system that places no demands on a normally loaded electrical system. It provides a hot spark at all speeds and minimizes fire hazard with elimination of supply leads. With Bendix Magneto Ignition, contact points and distributor electrodes have longer life because of inherent current reversal, and ignition is radio-shielded and water-proofed. Service, too, is far easier due to compactness and simplicity.

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Radiator Fan Drive

(Continued from page 48)

installed in the top tank of the radiator or other desirable place.

The piston in the control unit is provided with a recess to allow it a free reciprocating movement on the stem, limited by an adjusting nut and actuated by the differential of two opposing forces acting on the piston, namely the air or oil pressure and the piston spring pressure. With the rise of the engine coolant temperature, the expanding thermostatic element in the control power unit, acting on the actuator post and piston stem (see illustration), moves the valve piston toward its seat, a rubber seal ring. The length of the piston stem and the length of a pressure release set screw are so adjusted that at a predetermined temperature the piston contacts the seal ring shutting off the air or oil flow. Simultaneously the pressure release set screw opens the check valve to relieve the air or oil pressure in the clutch of the fan drive.

When the piston and the pressure release set screw reach the seal ring and the check valve respectively, reducing pressure on the piston, the piston spring urges the piston to move swiftly upward on the stem, into the rubber seal ring, shutting off the air or oil flow and relieving the pressure in the clutch instantaneously.

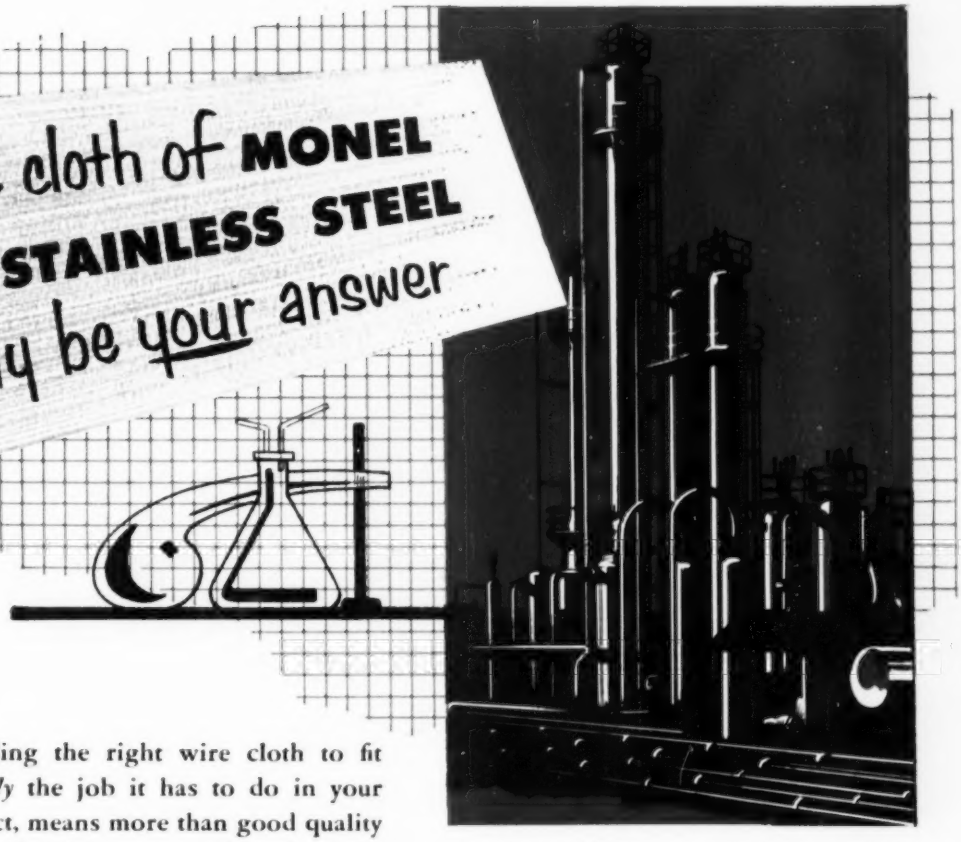
When cooling, the process is reversed. The return spring, acting on the contracting thermostatic element through the actuator post, moves the piston out of the rubber seal ring. At the separating point, at a predetermined temperature, regulated by the setting of the adjusting nut, the inrushing air or oil forces the piston to move against the piston spring, away from the rubber seal ring, opening the piston valve fully for the air or oil flow to the clutch and simultaneously closing the check valve.

This instantaneous and decisive opening and closing of the valve reduce to a minimum the time during which slippage occurs in the clutch.

Control valves operated by oil pressure are provided with an oil return line connected to the exhaust port of the check valve.

Both the air and oil operated types of fan controls are made to fail safe, so that there is automatic fan engagement in case of a pressure loss.

wire cloth of MONEL or STAINLESS STEEL may be your answer



● Finding the right wire cloth to fit *precisely* the job it has to do in your product, means more than good quality and uniformity . . . more than the right type and size of wire, or mesh, or type of weave. It has to be right metallurgically and chemically . . . to prevent failures . . . to improve your product performance.

Reynolds stainless steel, or Monel metal cloth has a remarkable range of properties, in addition to resisting chemical and atmospheric corrosion. Stainless steel resists oxidation, and oxidizing solutions. It resists many acids; acid and alkaline salts; acetone, ethyl alcohol, benzene, chloroform, etc.

Stainless steel wire cloth as Reynolds makes it, is shock-resistant and non-magnetic, with good weldability . . . is strong enough to defy high temperatures and resist scaling; tough enough to take sub-zero temperatures to minus 320° F. *Consult Reynolds engineers.* No cost or obligation.

Reynolds WIRE cloth protects performance

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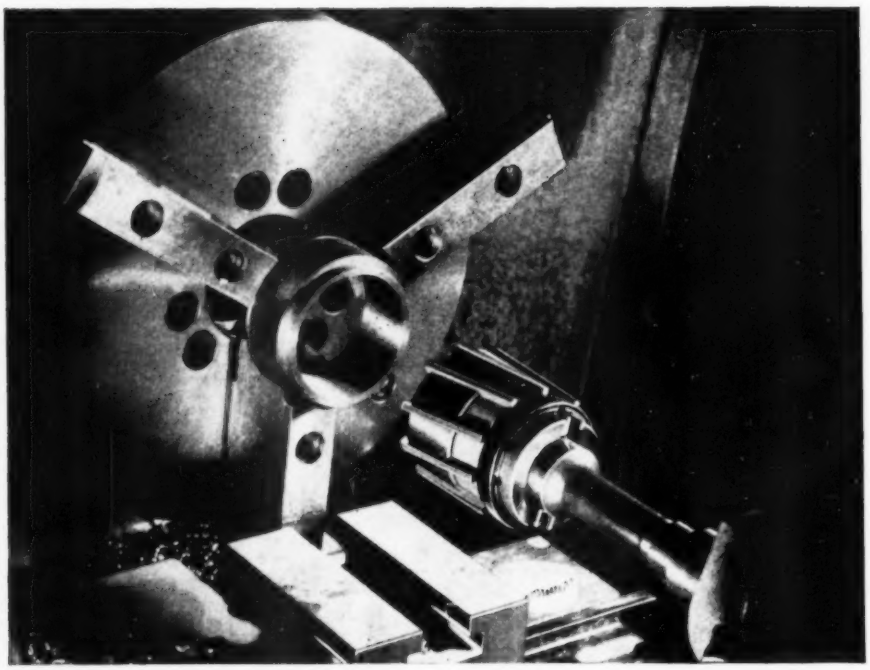
WAGNER LITHO MACHINERY...*Jersey City, N. J.*	Metal Decorating Equipment
WORCESTER WIRE WORKS...*Worcester, Mass.*	Round and Shaped Steel Wire, Small Sizes

NS NATIONAL-STANDARD Company NILES, MICHIGAN



REAMER DESIGN Controls

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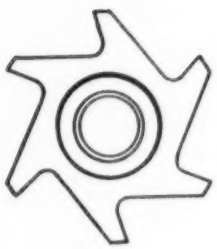
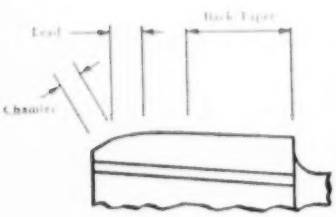
Barber-Colman Reamers produce finishes which were not previously considered possible on a standard production operation. Exceptional accuracy and tool life are also obtained on production runs as a result of the special features of Barber-Colman Reamers. Both solid-fluted and inserted-blade reamers are available.



Irregular flute spacing provides a smooth cutting action and fine finish, and helps to prevent the reamer from forming "welts". As a standard feature on all Barber-Colman Reamers, flutes or blades are spaced diametrically opposite each other so that they are easily checked with a micrometer.



The profile form on Barber-Colman Reamers is designed to produce the best possible finish and tool life. Following the chamfer, the lead is blended into a radius to produce exceptionally fine finishes. Through Barber-Colman cam-controlled sharpening, a sharp cutting edge, rather than a cylindrical land, is produced, resulting in a freer cutting action. With this control, successive reamers are sharpened with exactly the same profile form and relief angles to provide exact duplication of size, straightness and roundness.

DESIGNERS OF STANDARD AND SPECIAL

20-25 micro-inch finish typical

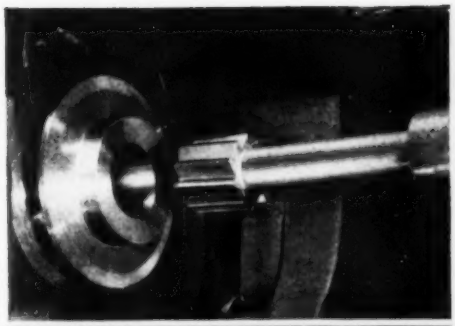
On this job, 1000 pieces are reamed to a surface finish of 20-25 micro-inches before it is necessary to re-sharpen the reamer. The feed is 1.75" per minute at 280 rpm., requiring 30 seconds to ream the 7/8" length of cut. Material is AISI C1137 steel.

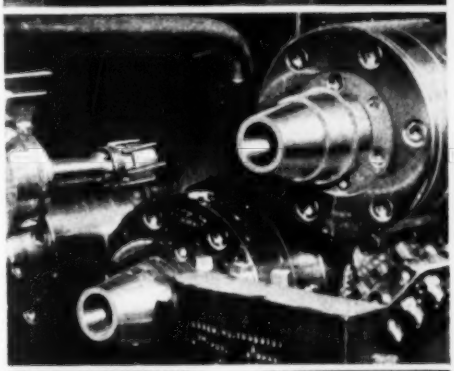
1500 pieces per sharpening

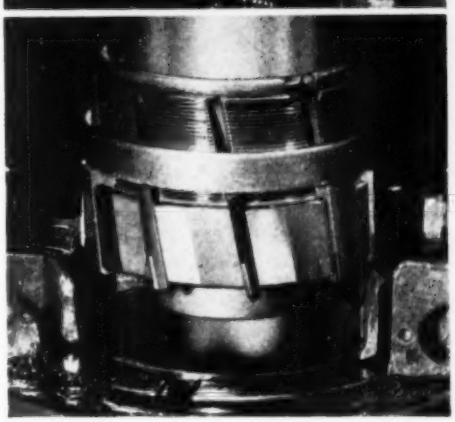
This carbide-tipped inserted-blade reamer produces from 1100 to 1500 pieces per sharpening while maintaining the finish better than 60 rms. Tolerance on hole size is .002". Stock removal is .012" to .015" on the diameter, and the material is B1117 steel. Speed is 105 sfm, and the feed is .0188" per revolution. A Barber-Colman Reamer Sharpener reproduces the correct profile on the reamer blades with each sharpening.

tool cost reduced from $1.57 to $1.32

These Barber-Colman Reamers are producing truck cylinder liners with accurate straight round holes free from welts or taper at a tool cost 15% less than previous records. Material is cast iron. Replaceable blades with carbide tips give long reamer life and cutting edges which stand up under continuous production. 675 more pieces per set of blades are now obtained, and tool cost per 100 liners has been reduced from $1.57 to $1.32.







If you are now choosing between accurate, quality-finish reamed holes — and low-cost production and tool maintenance — you can have both, using Barber-Colman Reamers. More flutes per cutting diameter, solidly backed cutting edges, and standard irregular flute spacing will give you tool room reaming quality under regular production conditions.

Send specifications on hole sizing and finishing problems to Barber-Colman engineers. They will furnish reamers for your particular requirements to give you the desired quality consistently.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 937 ROCK STREET, ROCKFORD, ILLINOIS

METAL CUTTING TOOLS SINCE 1908

Longest Le Mans

(*Continued from page 37*)

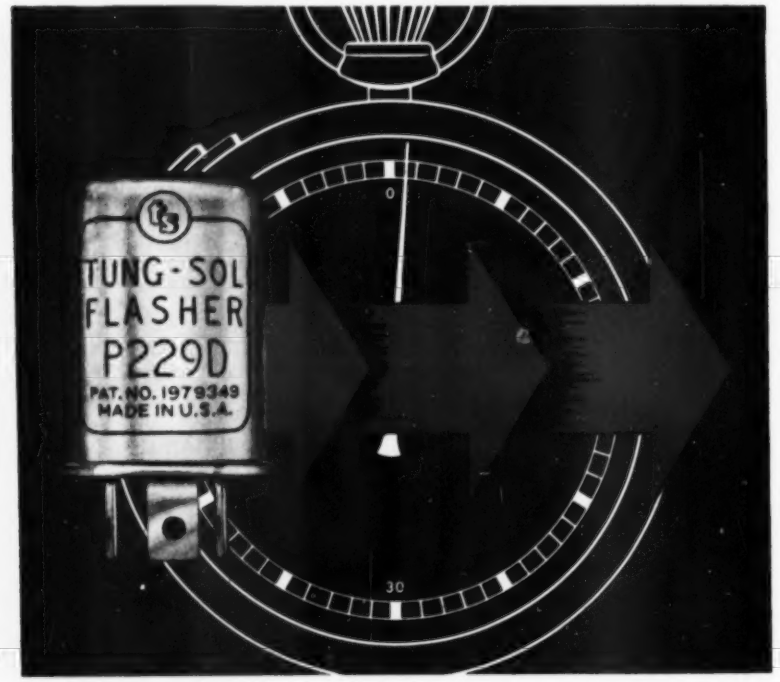
claimed by any competitor in the Le Mans race. These engines had a compression ratio of 9 to 1, a ratio which was exceeded only by that of the small Renaults.

Chassis construction was special and was not the same for all three cars. Apparently the fastest and the one to win third place in the race had a narrow frame with three-in. light alloy tubular main members stiffened by a rectangular section. This was the only car in the race without independent front suspension, use being made of a tubular steel axle, with attachment by a pair of radius rods on each side, these having ball and socket ends, and a central guide on the axle consisting of a bronze roller in a channel-section vertical member to eliminate all transverse movement of the front axle. Front suspension was by means of longitudinal torsion bars. This method of guiding the axle had a similarity, in principle, to that use on the rear end of the Pegasos. The rear axle was a Chrysler, with the necessary modifications for torsion bar suspension. The frame being narrow, tubular outriders provided for body support, the two open bodies having attachment by three bolts on each side. It was stated that one of the open bodies weighed only 264 lb. The closed body was practically 400 lb in weight. The fastest of the Cunninghams lost only 14 min, 30 sec for all pit stops.

Jaguar came forward with the XK 120C model, the latest of a long line of development of a six cylinder overhead camshaft 210 cu in. model. This was entered a year ago, but was eliminated by cooling troubles which have since been eliminated. The cooling system is pressurized to seven psi by a spring-loaded filler cap. Late engine changes were an increase in the size of the exhaust valves from 1 7/16 to 1½ in. and ports from 1¼ to 1⅜ in. Changes were made in the valve springs to allow operating up to 6500 rpm, and the valve lift was increased. For the first time Jaguar used three dual Weber carburetors of two in. diameter, with the air intakes in an aluminum stabilizing box. Air for this box is admitted through a scoop on the hood and a fine gauze screen from forms the full length lid of the box and has an air-tight joint when the hood is fastened down. The rough gauze at the mouth of the scoop and the big area of the fine mesh gauze on the top of the box make an air filter unnecessary. This arrangement, which is becoming general on European sports cars, has the advantage of drawing in cold air from the outside, instead of hot air from under the hood.

Among the Jaguar innovations was the use of disk brakes produced by Girling under Dunlop patents. Some trouble had been experienced by the overheating of the fluid in the hydraulic brake cylinder, but this has been overcome by separating the brake pad housing from the hydraulic cylinder. At Le Mans, where efficient braking is an essential, this disk system gave entire satisfaction. Jaguar used open bodies on all cars. The frame was a built-up tubular construction, with screw-fastened light-alloy panels.

Whether open or closed bodies should be used for sports car still is a matter for discussion. All the



Within half a second, the TUNG-SOL Flasher is in operation; providing a blinking signal more quickly than any other type of flashing device.

Instant Warning!

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Newark 4, N. J.

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Power for Power-Steering

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Now in production on 10 passenger cars, and used by other manufacturers for transmission, lubrication, and hydraulic control

For your new models—advanced low-cost design, reduced horsepower requirement, new systems.

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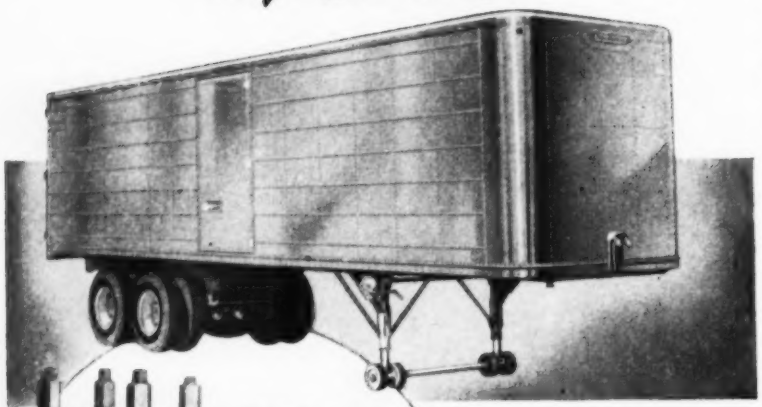
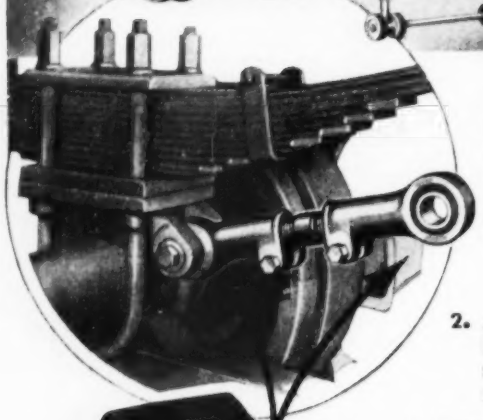
TRAILMOBILE

RADIUS ROD JOINTS
by LORD

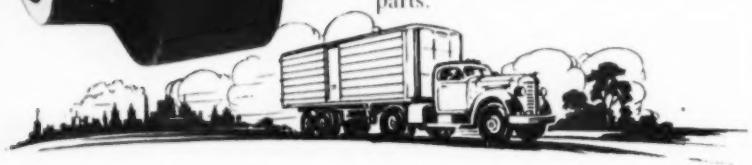




Look at the Trailmobile radius rod joint shown in close-up at the left. This Lord high performance center-bonded-rubber joint .....

1. Saves manufacturing and maintenance cost,
2. Absorbs the shocks of braking-loads and road irregularities imposed on the radius rods,
3. Provides necessary articulation.

When axle inspections require removal or replacement of radius rod joints, a simple arbor-press operation shortens loss of payload time and reduces actual repair cost. We invite you to avail yourself of our experience in designing and manufacturing precision bonded-rubber parts.



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LORD MANUFACTURING COMPANY • ERIE, PA.

LORD BONDED RUBBER

Headquarters for
VIBRATION CONTROL

Italians favored closed cars, and as the rear was required for the fuel tank or spare wheel, or both, use was made of two-door, two-passenger bodies. As four seats had to be furnished with four doors, this type found no favor. The English were undecided as to body types. Bristol, with its aviation background, produced two coupes claimed to have given excellent results under wind tunnel tests, which featured a rearward positioning of the drivers, a very considerably inclined windshield and two stabilizing fins. Drivers claimed that these body lines gave great steadiness at high speeds, but the maximum was not as high as expected and in each case a broken connecting rod eliminated the cars.

Panhard, with an aircooled flat twin of 42 cu in., produced a new model, designed by an aviation expert, taking the form of an airplane wing, along the entering edge of which there was a slot, through which air was ducted direct to the exhaust ports and expelled through louvres on the top of the "wing." There was no lower or lateral escape for the air. To accommodate headlights, the forward outer portion of the "wing" took a circular-section airplane nacelle form. With this two passenger body, entirely of light alloy, on a light alloy box section frame, total weight was just under 1000 lb.

Talbot, with a new valve-in-head six on a box-section frame, made use of a non-load carrying light alloy open body in three sections. These were stiffened internally by a rectangular-section duct taking air from the front and carrying it to the rear wheel housings, with bleeds for the exhaust pipe and the driver's compartment.

Aston Martin, with inboard rear brakes, fitted an air scoop on the cowl and carried the air to the rear by means of a large-diameter flexible pipe inside the body. The Italians in general fitted air scoops on the top of the rear fenders, to direct air over both the tires and the brake drums. On the new Alfa-Romeos the light alloy drums were cast with circumferential helical fins.

AUTOMOTIVE INDUSTRIES . . .
is your News Magazine of Automotive and Aviation
MANUFACTURING

Prior to the use of Celoron Gears in the textile printing machine shown above, metal gears driven from the main gear had to be replaced after one to two months' operation. They also wore out the expensive main gear, resulting in costly replacement and maintenance, as well as a delay in production.

But since installing nine C-D-F Celoron gears over a year ago, there has been no wear on the main gear, no replacement of Celoron gears. C-D-F Celoron gears are extra strong, extra silent in operation. Celoron maintains its high strength and resiliency at continuous temperatures up to 225° F. Celoron is a laminated plastic produced under high pressures. It resists oil, water, many corrosive chemicals.

Suitable for many gear applications, Celoron is easily and rapidly machined. Every tooth is of uniform strength. For most gear requirements, Celoron blanks are bandsawed from sheets. Molded blanks can also be furnished. For specific details, see the C-D-F sales engineer (sales offices in principal cities). Or write for Celoron Gear Catalog and plastic machining notebook.

CELORON: **Why don't you "imagineer" with Celoron gears? They have thousands of applications: automotive, textile, printing and metalworking machinery. Celoron has high impact strength. Quiets noisy machinery. If it's gearing you're hearing, talk it over with your C-D-F sales engineer (sales offices in principal cities). He's a good man to know.**

THE NAME TO REMEMBER... CDF CELORON GEARS

Continental-Diamond Fibre Company

NEWARK 2, DELAWARE

stamping capacity – for the TOUGH jobs

CUSTOM-DESIGNED CONTROLS

Danly Controls are engineered to the individual press in accordance with the specific operating requirements . . . providing simplified installation, greater safety and ease of operation. Note the Danly Master Control Cabinet in the background, "packaged" for efficient installation and maintenance.

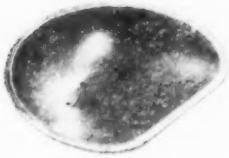
GREATER PRESS ROOM FLEXIBILITY

View of Danly 600-ton Single Action Straight Side Press in operation. Danly's extra-rigid construction assures full rated capacity . . . for bigger work, heavier work, more kinds of work. It's built to stand up under around-the-clock operation, too, to meet emergency production demands.

PRODUCTION TIME CUT IN HALF

4 single stage dies are involved in stamping the farm tractor seat pan shown . . . but only 2 stamping operations are necessary instead of 4. 2 operations are performed at one stroke. Dies are mounted two at a time to produce 300 pieces per hour—cutting production time in half!

a DANLY PRESS *does it!*



FOR WISCONSIN METAL PRODUCTS CO.

The addition of this 600-ton Danly Straight Side Press represents an important expansion of shop capacity for the Wisconsin Metal Products Co., of Racine, Wisconsin. It means far more than just another press because its 96 by 42 inch bed opens up a whole new field of operation in large stampings . . . and provides important "capacity insurance" for a wider variety of jobs.

Exclusive Danly Press features mean lower stamping costs too. Automatic *oil* lubrication decreases maintenance requirements . . . the Cool-Running Clutch wears longer, reduces down-time . . . greater structural rigidity assures less vibration and bed deflection, increases die life. Whatever your requirements, there's a Danly Press designed to increase *your* stamping capacity—for the TOUGH jobs.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

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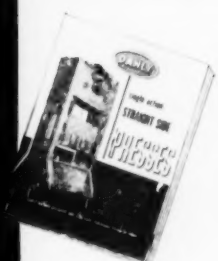
MECHANICAL PRESSES . . . 50 TO 3000 TONS

HYDRAULIC METALWORKING EQUIPMENT



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. . . see how you can put Danly Presses to work in your plant for increased capacity at lower cost!

It costs less to run a DANLY PRESS

Single Action Straight Side | Autofeed | Underdrive Single, Double, Triple Action | Gap Frame | Double Action Straight Side

Anti-Friction Bearings

(*Continued from page 56*)

results from a molecular or atomic rearrangement. This is principally the phase change from austenite to martensite. Satisfactory stabilization procedures must correct both conditions.

The amount of austenite retained after the hardening operation is dependent upon several factors—alloy composition, time and temperature of austenization, severity of quench, etc. However, even with good control, some austenite usually is retained. It is inherently unstable and prone to transform to some more stable condition. Transformation by natural aging usually is a very lengthy process, but may be accelerated by cold work and other means, including sub-zero refrigeration. Most steels used in the bearing industry will transform almost completely in the temperature range −120 to −150 F. As martensite usually is formed by this treatment, volume changes result and also high internal stresses. A noticeable increase in hardness often occurs. Therefore, stabilization procedures are best performed before final sizing. Since retained austenite is difficult to grind without cracking, this stabilization is best accomplished as an integral part of the heat treating cycle before grinding. Such procedures usually consist of one or more cyclic treatments at sub-zero temperatures followed by tempering. Similar treatments during rough and semi-finish grinding operations also are believed beneficial.

The refrigeration equipment employed for stabilization is also commonly used to shrink bearing components for assembly and installation purposes. For example, an inner race often is cooled to cause it to contract while the outer race is heated for expansion to facilitate loading of the balls or rollers. Also the special work table bearings of Frauenthal precision grinders are shrunk to permit ease of installation in the housings. These are "ultra-precision" bearings made and stabilized by Kaydon for the Frauenthal Grinders which are made by the Frauenthal Division of the Kaydon Engineering Corp.

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SMALL MOTORS
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LOW VOLTAGE DC
to your specs
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STARTING MOTORS • REGULATORS • SWITCHES
TRUCK
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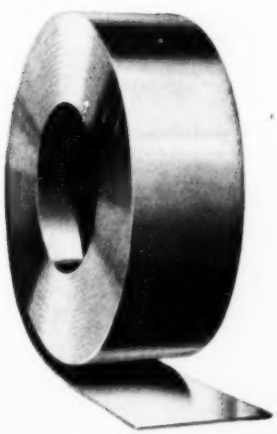
INDUSTRIAL

BOOKS . . .

TRAFFIC MANAGEMENT IN INDUSTRY, *by Leslie A. Bryan, published by The Dryden Press, 31 W. 54th St., New York 19, N. Y. Price, $5.50.* The transportation industry in the U. S. has undergone many significant changes in the last 20 or 30 years. Systems of air and motor transportation have been greatly expanded, new equipment has been developed to meet the need which this expansion has produced, and old equipment has been improved. But perhaps the most significant change has been the rapid establishment of traffic management as a profession. It has become an increasingly complex field, and businessmen are coming more and more to recognize the importance of the well-trained traffic manager to the smooth and efficient functioning of industry. The organization of the material in this book reflects experience gained through many classroom presentations. The opening chapter serves as a general orientation to industrial traffic management. Succeeding chapters describe the general functions of a traffic department, its organization, personnel, and administration. Then follows a detailed discussion of specific duties in connection with rates, expediting, intra-plant transportation, materials handling, and local transportation. Other chapters deal with traffic geography; express, mail, and passenger service; and traffic service organizations. The legal aspects of traffic and transportation—bills of lading, claims, routing, and I.C.C. procedure and practice—are discussed in detail.

— another instance where

Superior Stainless *shines!*



The stainless steel windshield wiper on your car does a sparkling job when the going is wet . . . stays bright and rustless over years of exposure to the worst of weather . . . and is very likely to be made of SUPERIOR Stainless Strip Steel. As original equipment on a variety of cars, and sold by thousands of service stations, garages, car dealers and supply stores, windshield wiper arms and blades of Superior Stainless highlight in service the quality of their metal. ● Can we help you with *your* projected applications?

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SHORTIES

Truck output of the past 7½ years exceeds the total number built during the 36 years from 1900 to 1937.

•

There now is one truck for about every 16 persons in the U. S.

•

Today's automobile carburetor has perhaps 200 parts shaped on screw machines.

•

In 1933, 150 companies did $25 million worth of business in screw machine products. In 1952, 1200 or so companies did a total business of well over $200 million.

•

The price tag on a new two-door sedan would be $50,000 if the automobile were made by hand.

•

Human muscle-power costs $10.00 per hp-hr, compared to four cents for electrical energy.

•

Federal excise tax collections on automotive products topped the $2 billion mark in 1952.

•

Driving one hour at 40 mph, the 16 valves in an average eight-cyl engine will open and close 840,000 times.

•

In an intercontinental bomber, the distance between the pilot and engines equals one-fourth the length of a football field. The tail of the plane is over half the length of a football field behind the pilot.

•

U. S. international airlines used 165,919,489 gal of gas and 1,741,678 gal of oil in trans-oceanic air travel during 1952.

•

The bomb bay of a modern heavy bomber has the capacity of two five-room houses.

put colorful products in your customer's hands

The recent trend toward brighter colors in the kitchen led one of the nation's foremost manufacturers of toasters to consult PRP. Toaster knobs and handles were requested in red, yellow and green. For years all such parts had been made of brown or black phenolic plastic. A new, colorful, heat-resistant substance was needed . . . Melamine plastic was selected because of its heat resistance and wide range of colors. Quantity parts were supplied, helping the toaster to climb in popularity and thus meet the modern trend . . . Whatever your problem in plastic parts—from appearance to precision molding—PRP stands ready to work with you toward improving your product and profits.

when you look for plastic moldings, look first to **P**lastic **R**esearch **P**roducts, Urbana, Ohio

PRP

The BUSINESS PULSE

(*Continued from page 78*)

is widely felt that these repairs would have been delayed a while longer if demand had continued at the hectic pace prevalent through the spring. Nevertheless, the near-term outlook remains exceptionally favorable, and there is little doubt that operations will continue close to capacity levels through the third quarter in view of the substantial backlog of orders on mill books. However, the possibility of a moderate downturn in the final quarter of the year now seems stronger than it did before the wage issue was resolved.

Used Cars Accumulate

The situation in the automobile industry also suggests the possibility of some easing before the year's end. So far production schedules have been held at the highest levels that available manpower and materials supplies would permit and sales of new cars have been maintained well ahead of comparable 1952 totals. There is doubt, however, that this situation can be maintained if the present unfavorable situation in the used-car market continues. Stocks of used cars are known to be larger than at any time in recent months and apparently continue to grow, despite heavy promotional efforts. At the same time, prices of used cars have been moving down sharply. Reports indicate that many dealers have been overallowing on trade-ins in order to maintain new-car volume, but it is obvious that with used-car stocks rising and prices falling, there is a limit to their capacity to do this. It would seem inevitable that when dealers can no longer offer attractive trade-in allowances to prospective buyers of new cars, volume must decline. So far manufacturers have not expressed anything that could be termed alarm regarding this situation—at least for the record—but it would be difficult to isolate any single factor in the present business situation that is causing more concern.

Shortage of Mortgage Money

Similarly, there is considerable uncertainty regarding construction prospects, despite present high levels of activity. Builders are disturbed about the prediction of a decline in the rate of household formation and also about the continuing shortage of mortgage money. They cited the money scarcity as a factor in the slight decline which occurred from April to May in the number of housing starts, spokesmen predicting that construction employment would fall off in the summer months unless something were done to facilitate the purchase of homes. Efforts have been made to secure a liberalization of down-payment requirements on homes financed with Government-guaranteed mortgages, but at this writing it is an open question whether Congress will provide authority for such a liberalization before adjournment.

Complicated Outlook

As a further complication regarding the outlook, there is currently being witnessed a rise in prices of certain key materials and some manufactured products at a time when competition is rising and when inflationary pressures seem to be in abeyance. The outstanding development of the recent past in this con-

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for over 40 years

SINCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled — uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

For further information about our specialized production of hardened and ground automotive and industrial parts, just drop us a note. We invite an opportunity to quote on your work.

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. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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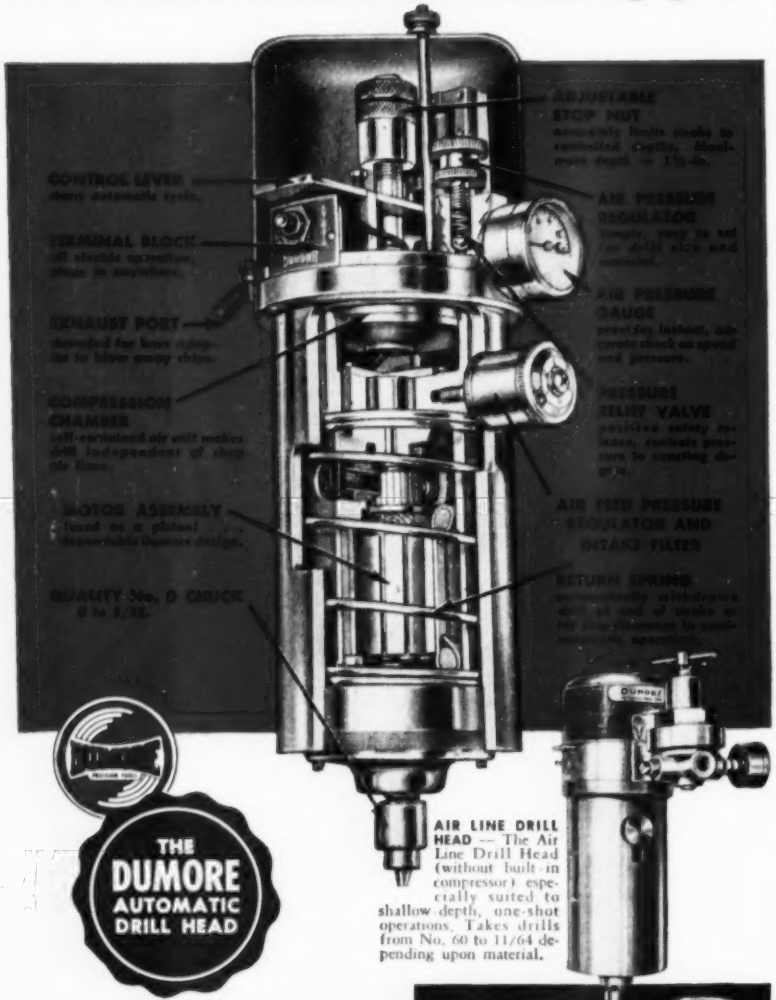
MORE HOLES PER DAY
on small diameter drilling jobs



THE DUMORE AUTOMATIC DRILL HEAD

AIR LINE DRILL HEAD — The Air Line Drill Head (without built-in compressor) especially suited to shallow depth, one-shot operations. Takes drills from No. 60 to 11/64 depending upon material.

WITH the Dumore, size of drill and hardness of material determine speed and pressure at drill point. Pressure is positively regulated by a sensitive relief valve. This assures uniform drill penetration, reduces breakage and prevents overloading. Drills cut smoothly, retain their edge longer.

The Dumore starts and withdraws automatically. Depth and center are accurately maintained to exacting limits on every stroke.

As a result, even with relatively untrained operators, you get more production per day and less drill breakage due to operator error — even on jobs requiring No. 80 drills.

In addition, the Dumore is self-contained, independent of shop air lines. It quickly adapts to any specific production arrangement. Minimizes special tooling and fixtures.

COMPACT IN SIZE — 14½" long, 4½" in dia., weighs 17½ pounds. Completely automatic, built-in controls. Meets a variety of installation applications.

Available attachments include: Bench Stand Repeat Cycle Timer, Mounting Brackets, Foot Control Switch.

Ask your Industrial Distributor or write the Dumore Company for complete details.

DUMORE PRECISION TOOLS

The Dumore Company

1339 Seventeenth Street • Racine, Wisconsin

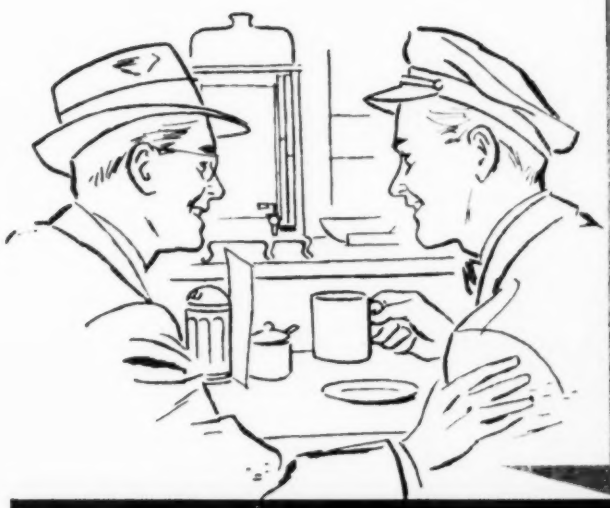
nection was the advance in basic steel prices by an average of $4 per ton, but also of importance have been increases in crude oil and in some chemicals. With the general trend of prices still tending downward and with growing competition in evidence in retail markets, it is apparent that some manufacturers are going to have great difficulty in passing along the higher costs. If individual businesses do attempt to maintain their unit profit margins, it would seem that sales volume and in turn employment may suffer, with possibly serious adverse effects in an aggregate sense.

BOOKS . . .

THIS UNSUCCESSFUL AGE, *by Walter Eucken, published by Oxford University Press, 114 Fifth Ave., New York, N. Y. Price, $2.00.* The economic experience of the last fifty years has seen much failure and has brought disillusionment both to those who advocate what is known as the *laissez-faire* policy and to those who put their faith in a centrally planned and state controlled economy. The author poses at the outset a general question—"how can the modern industrialized economy and society be organized in a humane and efficient way?"—and then seeks to find an answer to this question by analyzing Germany's economic experiments in this century and by general conclusions which are of up-to-date application to our present economic situation. He considers that the period under review was one of experiments, unsuccessful experiments, and maintains that the time has now come when we should learn from experience rather than rely on outmoded ideologies. He thus faces up squarely to the lessons which Germany's recent economic history teaches and in so doing presents his readers with the crucial issues which confront the liberal economist in an industrialized society—freedom of contract versus the competitive principle, economic power versus the freedom of the individual, private enterprise versus central planning and state control. German experiments sought to solve the problems arising from a concentration of economic power in private hands by transferring that power into the centralizing hand of the totalitarian state. On the other hand, a policy of complete *laissez-faire* permits misuses that destroy freedom in their turn. His solution for this crucial dilemma lies in a differentiation between form and process and he contends, in his concluding chapter, that while the state should influence the forms of economy, it should not itself direct the economic process.

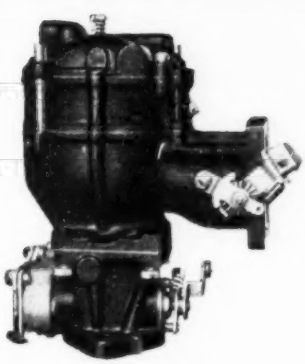
CIVIL AIR REGULATIONS AND REFERENCE GUIDE FOR A & E MECHANICS, *published by Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif. Price, $2.00.* The contents of this 120-page reference manual include reprints of regulations on the repair and airworthiness of aircraft and engines, requirements to obtain a mechanic's certificate, and requirements for an authorized repair business. Also included are "Questions and Answers On Civil Air Regulations," and samples of the various printed forms that mechanics must use, such as inspection, repair, and airworthiness reports.

Does He Knock or Boost Your Truck?



IT ALL DEPENDS ON PERFORMANCE and PERFORMANCE DEPENDS ON

Zenith CARBURETORS



What drivers and operators say about your vehicles has a mighty important bearing on the future of your business. So it is imperative that every component be selected on the basis of its contribution to lasting, satisfactory performance. In the field of heavy duty carburetion Zenith* has long been recognized as the engineer's choice for quality performance under all operating conditions. You can be sure that manufacturers whose vehicles are Zenith equipped measure carburetor costs in lasting terms rather than initial expense. Zenith's rugged construction, strong idling, freedom from stalling and obedient response to every power demand goes a long way toward building owner good will. That's why cost conscious operators and experienced drivers prefer Zenith equipped vehicles.

*REG. U.S. PAT. OFF.

ZENITH CARBURETOR DIVISION OF Bendix AVIATION CORPORATION

696 Hart Avenue · Detroit 14, Michigan

Export Sales: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to June 25, 1953, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which were published in the June 15 issue, page 86, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Defense Production Administration, May 14, 1953, to June 25, 1953.

Included in this latest tabulation, 17,250 new or expanded defense facilities of all types have been authorized for rapid tax write-off, the total amount eligible for amortization, being $27,144,279,000. These figures are exclusive of cases that are up for later review but included in this list —in these cases no dollar amount is listed. The figure appearing in parentheses is the percentage authoried for actual fast tax write-offs.

AIRCRAFT
GENERATOR
TESTER
Sun model AGT-7
Especially designed to comply with United States Air Force Specification MIL-S-7223, this unit will test 28-volt aircraft and similar DC generators with output capacities up to 600 Amperes and speed ranges from 2000 to 11,600 RPM.

industry's leaders depend on Sun

. . . for special-order, built-to-specification scientific test equipment . . . SUN Electric Corporation is the world's largest manufacturer of Automotive and Aircraft Electrical and Electronic Testing Equipment, supplying approximately 70% of the testing equipment of this type to U.S. automotive dealers. That is why the leaders in every branch of the industry look to SUN as the logical choice to design and build special scientific equipment to meet their particular testing needs. The unit pictured is an example of a test problem solved with such specially designed equipment. Other SUN special-order units are in use in car, truck and tractor factories, aircraft and ordnance plants and in the factories of engine and component parts manufacturers everywhere. In production testing, spot checking and in quality control of material these special SUN Testers offer a high speed simplified operation that will save thousands of dollars and many production headaches.

SUN Engineers will be glad to discuss the design of special test equipment that can solve *your* testing problems too! Write TODAY for the SUN SPECIAL TEST EQUIPMENT Catalog.

SUN Equipment is available in 6-12-24 volt units.

117

Sun ELECTRIC CORPORATION
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—A—

Aeroforms, Inc., Hicksville, N. Y.
Components of defense items—$19,798 (70)

—B—

B. G. Instrument Corp., Corona, N. Y.
Aircraft parts—$536 (70)

Baldwin-Lima-Hamilton Corp., Eddystone, Pa.
Hydraulic turbine, presses and Diesel locomotives—$2,010,650 (50)

Bell Aircraft Corp., Wheatfield, N. Y.
Ordnance—$200,000 (40)

Bendix Aviation Corp. (Pacific Div.), North Hollywood, Calif.
Ordnance & aircraft parts—$43,218 (65)
Electronic equipment—$25,000 (40)

Boeing Airplane Co., Seattle, Wash.
Aircraft—$129,100 (60)

Borg-Warner Corp., Bedford, Ohio
Aircraft parts—$41,771 (65)

Borg-Warner Corp. (Norge Div.), Muskegon Heights, Mich.
Aircraft parts—$134,250 (50)

—C—

C & E Mfg. Co., Detroit, Mich.
Aircraft parts—$3,691 (70)

Congoleum-Nairn, Inc., Kearney, N. J.
Aircraft parts—$10,110 (65)

Consolidated Industries, Inc., West Cheshire, Conn.
Aluminum, steel & titanium forgings for aircraft—$149,135 (65)

Continental Motors Corp., Muskegon, Mich.
Aircraft components — $1,901,000 (60)

—D—

A. B. Dick Co., Chicago, Ill.
Aircraft parts—$41,120 (65)

Douglas Aircraft Co., Inc., El Segundo, Calif.
Aircraft & aircraft parts—$53,168 (60)

Douglas Aircraft Co., Inc., Long Beach, Calif.
Aircraft—$35,292 (65)

Douglas Aircraft Co., Inc., Santa Monica, Calif.
Aircraft—$257,540 (60)

—E—

Electrical Engineering and Mfg. Corp., Los Angeles, Calif.
Aircraft parts—$21,706 (70)

Electronic Instrument Corp., Belleville, N. J.
Ordnance—$90,000 (45)

(*Turn to page* 120, *please*)

JOHNSON MODERNIZED SLEEVE BEARINGS

SOLVE MANY SPECIFIC PROBLEMS

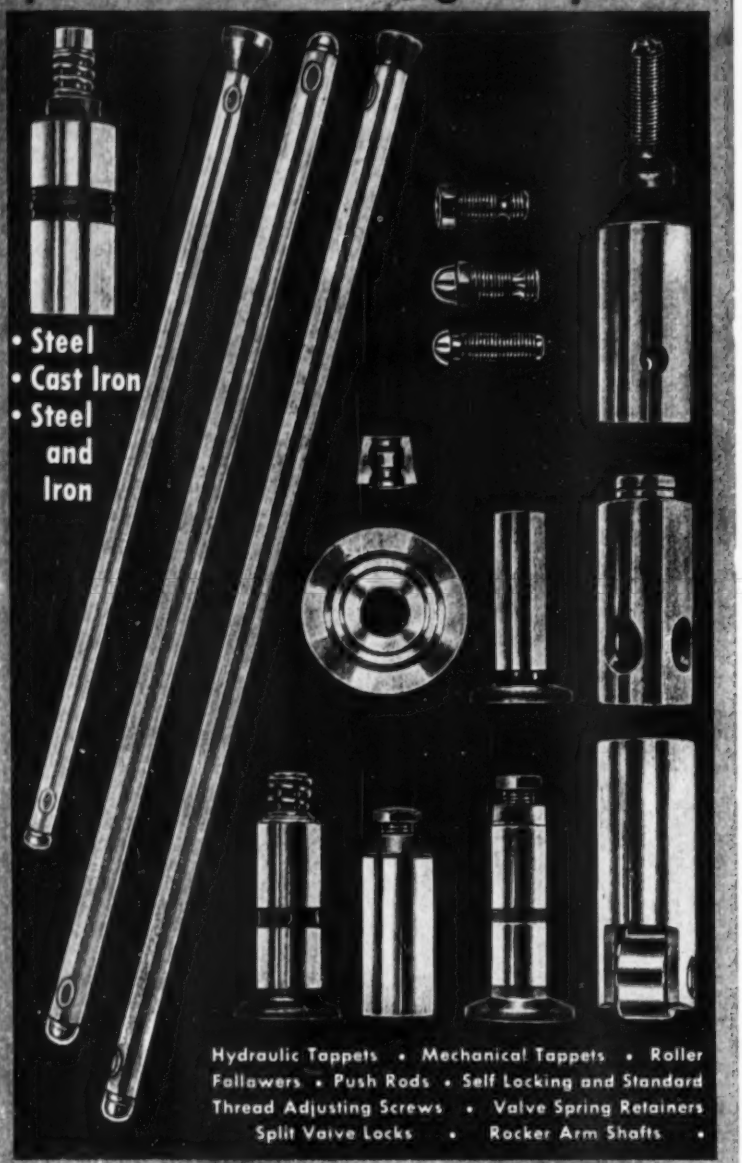
The sleeve bearing is basic in principle . . . for most applications man's genius has never invented any device to replace it. For instance, every internal combustion engine is dependent on it, and the majority of industrial equipment is, too. But modern requirements, high speeds, higher loads, and changing designs have called for new sleeve bearings. Johnson Bronze, alert to the demands of new engineering trends, is producing Johnson Modernized Sleeve Bearings, capable of giving the utmost service under these modern conditions. Aluminum bonded to steel is one of them. Copper-lead bronze-on-steel is another. New materials, new combinations of materials and new designs are meeting many new requirements. If you have a specific sleeve bearing problem, perhaps a Johnson engineer can help you. Write for an appointment.

JOHNSON BRONZE COMPANY
625 South Mill Street, New Castle, Pa.

JOHNSON JB BEARINGS
Sleeve-Type

JOHNSON BRONZE PRODUCES ALL TYPES OF SLEEVE BEARINGS: ALUMINUM-ON-STEEL • CAST ALUMINUM ALLOY • BRONZE-ON-STEEL, copper lead • STEEL BACK, babbitt lined • BRONZE BACK, babbitt lined • CAST BRONZE, plain or graphited • SHEET BRONZE, plain or graphited • LEDALOYL powder metallurgy

"CHICAGO"
precision valve gear parts



Hydraulic Tappets • Mechanical Tappets • Roller Followers • Push Rods • Self Locking and Standard Thread Adjusting Screws • Valve Spring Retainers Split Valve Locks • Rocker Arm Shafts •

Connecting Rod Bolts.....Hydraulic Cylinder Pistons
Cylinder Head Studs.....Cylinder Head Cap Screws
Main Bearing Studs.....Main Bearing Cap Screws
Flywheel to Crankshaft Screws.....Diesel Energy Cells
Wheel Bolts and Studs.....Differential Carrier Screws
Oil Pump to Distributor Shafts.....Remote Control Levers
Automatic Transmission Valves.....Water Pump Shafts

Special Screw Machine Parts 1/16" to 5" Diameter • Cap Screws • Set Screws • Nuts • Studs • Taper Pins • Socket Screw Products

The CHICAGO SCREW COMPANY
2801 WASHINGTON BLVD.
BELLWOOD, ILL.
Established 1872

(*Continued from page* 118)

— F —

Fairchild Engine & Airplane Corp. (Fairchild Aircraft Div.), Hagerstown, Md.
Aircraft & aircraft parts—$49,330 (65)

Fairchild Engine & Airplane Corp. (Fairchild Guided Missiles Div.), Wyandanah, L. I., N. Y.
Ordnance—$102,773 (65)

— H —

B. H. Hadley Co., Pomona, Calif.
Aircraft parts—$35,990 (70)

Heckethorn Mfg. & Supply Co., Littleton, Colo.
Ordnance—$63,758 (45)

Hussmann Refrigerator Co., St. Louis, Mo.
Aircraft assemblies—$117,151 (40)

— J —

Jack & Heintz, Inc., Cleveland, Ohio
Aircraft electrical equipment — $333,263 (60)

Janney Cylinder Co., Philadelphia, Pa.
Steel castings—$48,223 (65)

— L —

Lear Inc. (Learcal Div.), Los Angeles, Calif.
Scientific & technical equipment for defense—$16,423 (65)

Lockheed Aircraft Corp., Burbank, Calif.
Aircraft—$448,899 (60)
Aircraft & aircraft parts—$90,472 (60)

— Mc —

McMillen Grinding Co., Cleveland, Ohio
Aircraft parts—$10,150 (70)

— M —

The M. B. Mfg. Co., Inc., New Haven, Conn.
Aircraft parts—$169,838 (70)

Magnus Tool & Die Co., Newark, N. J.
Aircraft parts—$23,550 (70)

Master Mach. & Tool Co., Chicago, Ill.
Aircraft & electronic parts—$72,099 (70)

— O —

Olin Industries, Inc., East Alton, Ill.
Ordnance—$44,860 (40)

The Oliver Corp., Battle Creek, Mich.
Aircraft components—$74,445 (50)

Ozone Metal Products Corp., Ozone Park, N. Y.
Machining aircraft & electronic parts—$51,893 (70)

— P —

Plastic Inlays, Inc., Summit, N. J.
Ordnance—$29,610 (50)

— R —

Reo Motors, Inc., Lansing, Mich.
Army ordnance—$42,149 (65)

(*Turn to page* 125, *please*)

"On several of our trucks we have had no compressor failure in 400,000 miles with Wagner Air Brakes"

says: D. V. RADKE, General Operations Technician
DENVER-CHICAGO TRUCKING CO., Denver, Colorado

DENVER CHICAGO TRUCKING COMPANY, INC.

2501 BLAKE STREET • Telephone • KEystone 7261 • DENVER, COLORADO

Wagner Electric Corporation
6400 Plymouth Avenue
St. Louis 14, Missouri

Gentlemen:

We, here at Denver-Chicago Trucking Company, Inc., take great pride in the fact that we are the only coast-to-coast carrier in the United States. In order to maintain our standards of leadership we have come to realize that service is the very essence of our business; it is the keystone which means failure or success in the motor transportation industry. In Denver-Chicago's case, it has meant success.

Part of the service we render customers is making sure we live up to our responsibility of providing our drivers with trucks that are safe to operate, dependable in performance, and will take the punishment of coast-to-coast driving. I can truthfully say that our trucks equipped with Wagner Air Brake Systems provide ample braking power to safely bring these units to a safe stop at all times on the road.

I have been told by our Regional Managers that Wagner Air Brakes are economical to operate and require very little repair and replacement of parts. The Wagner Rotary Air Compressor is easy to install, quiet in operation, and provides ample air. On several of our trucks we have had no compressor failure in 400,000 miles with Wagner Air Brakes.

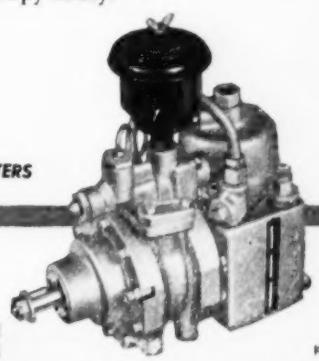
For these reasons, we specify Wagner Air Brakes when we order new equipment for Denver-Chicago.

Very sincerely yours,

D. V. Radke
General Operations Technician

Time and again, fleet operators like Mr. Radke have proven for themselves that Wagner Air Brake Systems keep costly maintenance expenses at a minimum and help meet on-the-road schedules which mean increased profits at the end of the year. Many agree that even after *years* of service, units equipped with Wagner Air Brake Systems never have compressor failure or require need for exchange. This outstanding record of proven dependability and service is largely due to the Wagner Rotary Air Compressor—the compressor that assures you an adequate supply of air at all times because it has a faster air recovery.

Give the vehicles you manufacture added brake economy and safety by including Wagner Air Brakes as standard equipment. Our engineers will gladly work with you and recommend the Wagner Air Brake System best suited to your particular requirements. Catalog KU-201 gives full information. Write for your copy today.



WAGNER AIR BRAKE USERS ARE OUR BIGGEST BOOSTERS

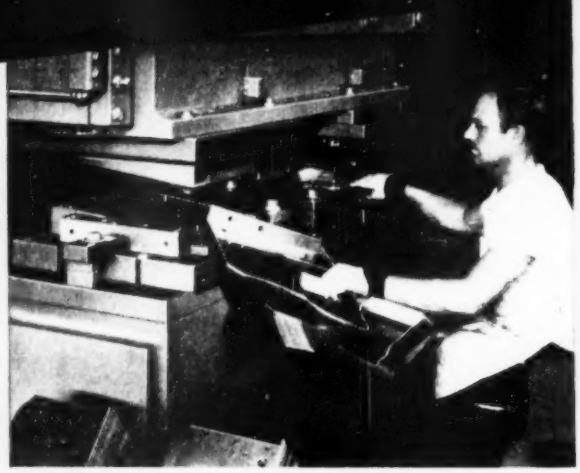
Wagner Electric Corporation
6363 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.
(Branches in Principal Cities in U. S. and in Canada)

LOCKHEED HYDRAULIC BRAKE PARTS and FLUID . . . NoRoL . . . CoMaX BRAKE LINING . . . AIR BRAKES . . . TACHOGRAPHS . . . ELECTRIC MOTORS . . . TRANSFORMERS . . . INDUSTRIAL BRAKES

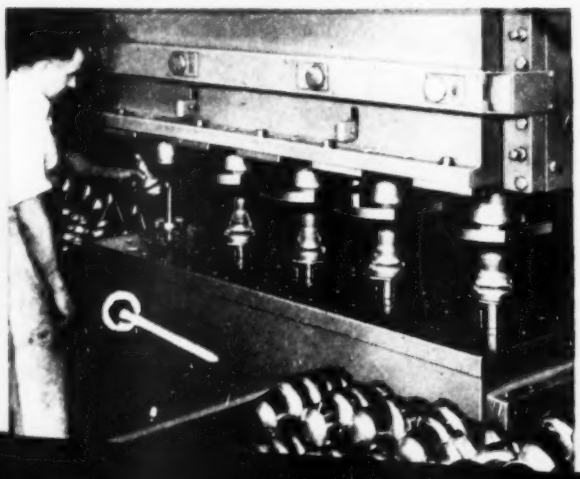
K53-7A

NIAGARA

SERIES B
GAP FRAME Double Crank Presses



Niagara B-4 x 72 Press at the General Machine Works in Los Angeles. It is shown here fitted with two dies for forming operations on an automatic deflector.



The same press as shown above arranged with dies for redrawing projectile parts in 5 steps. Shells are transferred manually from die to die.

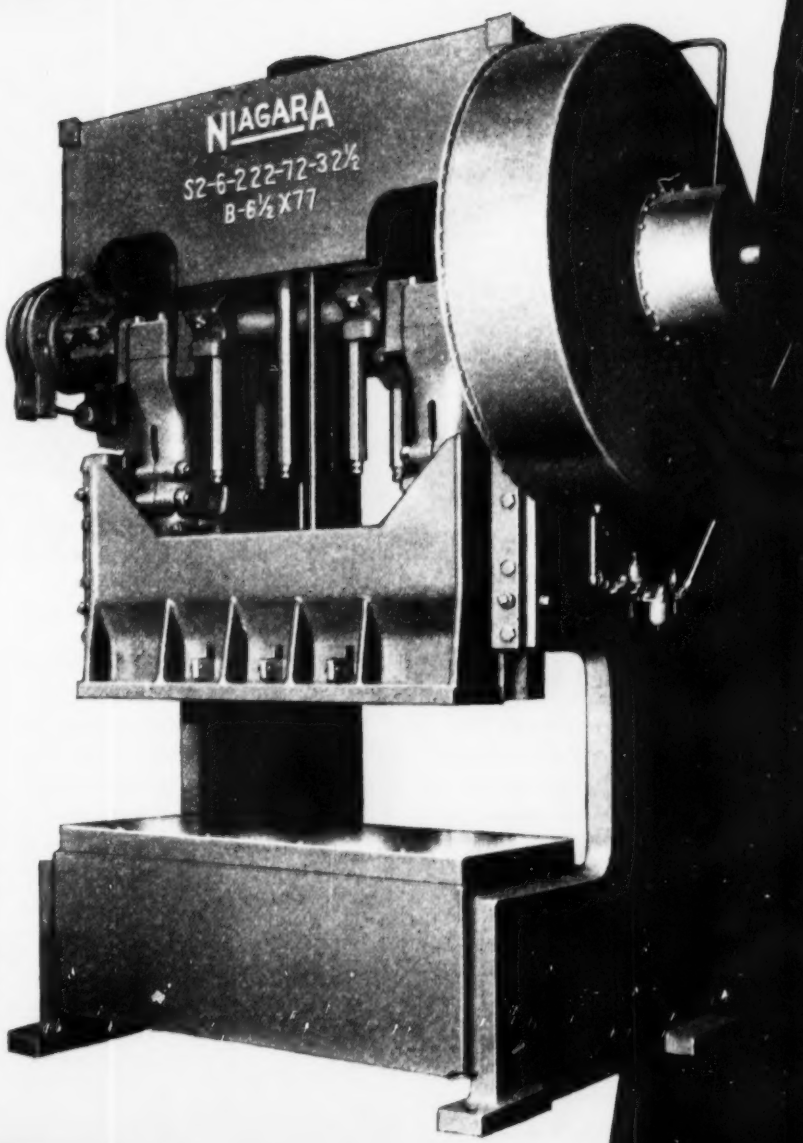
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

* *Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.*

Versatility and High Production

- Gap frame convenience with double crank width.
- Ideal for long progressive dies or multi-station dies.
- Rear of press open for full accessibility.
- One piece welded steel frame for maximum rigidity and long die life.
- Exclusive Niagara Sleeve Clutches for maximum productive strokes per minute and minimum maintenance cost.
- Niagara cushions for drawing operations.
- Automatic feeds for high production jobs.

Write for Bulletin



Niagara B-6½ x 77 Gap Frame Double Crank Press. Air actuated, electrically controlled sleeve clutch with friction clutch convenience and sleeve clutch economy. Air releasing brake. Clutch and gearing operating in a bath of oil. Air counterbalance for slide with surge tank over-size cylinder and pressure regulating valve to compensate for various weights of dies. Cross bar knockout in slide. V-belt motor drive.

DISTRICT OFFICES: NEW YORK • CLEVELAND • DETROIT • PHILADELPHIA

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you can depend on Chicago Rawhide for reliable solutions to your mechanical sealing and protection problems

SIRVENE

SCIENTIFICALLY COMPOUNDED ELASTOMERS

(Synthetic Rubber)

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Actual tests prove Sirvis packings require less replacement than any other type. Made in a complete line of cup, flange, U and V types from specially treated and tanned steerhide. Available in special designs, scientifically engineered to solve unusual situations.

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The "Perfect" answer to fluid retention, moisture and foreign matter exclusion, and similar mechanism protection problems. Used more than any similar device in motor vehicles, industrial machines, farm implements, and road machinery. Stocked in over 1800 sizes, covering 16 different types.

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(*Continued from page* 120)

—S—

The Sperry Corp., Great Neck, N. Y.
Electronic equipment — $466,401 (65)

—T—

Taber Instrument Corp., North Tonawanda, N. Y.
Aircraft parts—$72,579 (70)
Thor Corp., Bloomington, Ill.
Ordnance—$13,500 (65)
Type Machine Co., Cleveland, Ohio
Aircraft parts—$33,940 (70)

—U—

The United States Time Corp., Little Rock, Ark.
Ordnance—$26,592 (65)
The United States Time Corp., Middlebury, Conn.
Ordnance—$25,323 (65)
United Tool & Die Co., West Hartford, Conn.
Aircraft parts—$88,420 (70)

—V—

The Viking Tool & Mach., Belleville, N. J.
Aircraft parts—$45,570 (70)

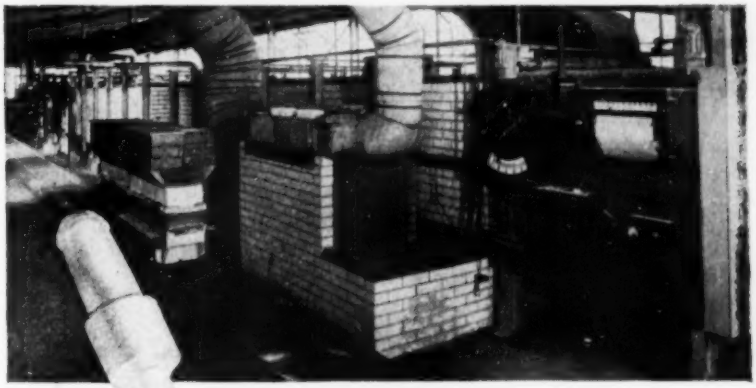
—W—

The Ward-Riddle Co., Ravenna, Ohio
Aircraft parts—$22,374 (70)
Weber Aircraft Corp., Burbank, Calif.
Aircraft parts—$38,493 (65)
Weichsel, Blossom & Bray, Inc., Hudson, Ohio
Ordnance—$42,471 (70)
Westinghouse Electric Corp., Pittsburgh, Pa.
Research & development of aircraft parts—$6,591,809 (65)
Worth Manufacturing Co., Los Angeles, Calif.
Aircraft parts—$7,582 (70)

BOOKS . . .

HIGHWAY—MATERIALS SURVEYS: BULLETIN 62, *published by Highway Research Board, National Research Council, 2101 Constitution Ave., Washington 25, D. C. Price, $1.50.* The problem of obtaining suitable aggregates and granular materials for highway-construction purposes under present economic conditions is a major issue at the present time in many states and fast becoming one in others. Present sources of acceptable highway materials under present demands will become completely exhausted, and new sources must be located. With these facts inevitable, the Committee on Materials Surveys was established by the Highway Research Board to study this problem. The work of the committee concerned itself with all aggregates emanating from natural gravel deposits or rock formations and directed its activities primarily to three specific objectives: (1) to conduct a world-wide survey to determine material-survey methods employed by the states and foreign countries; (2) to prepare a bibliography on the subject; and (3) to assemble and publish the most useful information consummated under the committee's work program. This 118-page publication presents in a symposium of four papers the latest information and developments in the field of material surveys.

AMERICAN ELECTRICIANS' HANDBOOK, *by Terrell Croft, revised by Clifford C. Carr, published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price, $10.00.* Fully revised in accordance with the 1951 National Electrical Code, this ready-to-use guide is packed with electrical facts and information based on sound engineering principles. It covers everything from fundamentals of electricity to practical suggestions for remedying the troubles of electrical equipment. Here are the data and guidance needed for the selection, installation, operation, care, and proper application of electrical apparatus and materials. The handbook has been designed as an authoritative jobbook for those with little electrical knowledge and for the trained electrician and engineer. Besides covering all the basic electrical jobs, it includes authoritative information on such subjects as electron tubes and circuits, fundamentals of construction, operation, and application of electronic devices in industry, control generators (Ampligyne and Rototrol), electronic control of motors, automatic electric drive control, synchros, dry-type transformers, copper-oxide and selenium rectifiers, Signalite fuses, thermoplastic insulated wire, load-center industrial distribution systems, fluorescent-lamp developments, and farm wiring.



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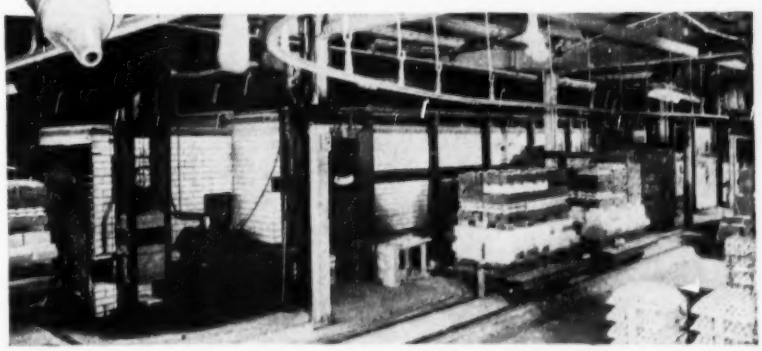
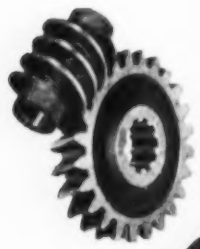
That's Frenchtown's kiln capacity! Frenchtown is the largest *independent* producer of spark plug porcelains; makes nothing but ceramics; devotes its entire engineering and production facilities to ceramics. And there are many Frenchtown ceramic compositions to meet a wide variety of voltage requirements. If you want the best in porcelain performance, look to the spark plug manufacturers who use Frenchtown insulators.

FRENCHTOWN PORCELAIN CO.
81 Muirhead Avenue • Trenton 9, N. J.



Here's why it PAYS to use . . .



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QUALITY PLUS—There is no finer recommendation for the quality of the product you sell than to be able to say that it is "EQUIPPED WITH FAIRFIELD GEARS!"

DEPENDABLE SOURCE OF SUPPLY— Supplier of precision-made, automotive type gears for over thirty years to leading builders of construction, agricultural, industrial, marine, and automotive equipment.

COMPLETE PRODUCTION FACILITIES—Unexcelled facilities in a new and ultramodern plant for producing Spur, Herringbone, Spiral Bevel, Straight Bevel, Hypoid, Zerol, Worms and Worm Gears, Splined Shafts, and Differentials to your specifications.

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LAFAYETTE,
INDIANA

for FINE GEARS

AIRBRIEFS

(*Continued from page* 80)

additional DC-6 transport. United now operates 62 DC-6's and averages about 10 hours per day utilization. Thus 10 min per airplane would amount to 620 min a day, or slightly more than 10 hours. United DC-6's average 2200 miles per day and earn $2.42 per mile flown. Deducting costs of 89¢ per airplane mile, leaves $1.53 profit per airplane mile flown or $1,167,160 for an annual mileage of 762,850 miles.

Fairchild Jet

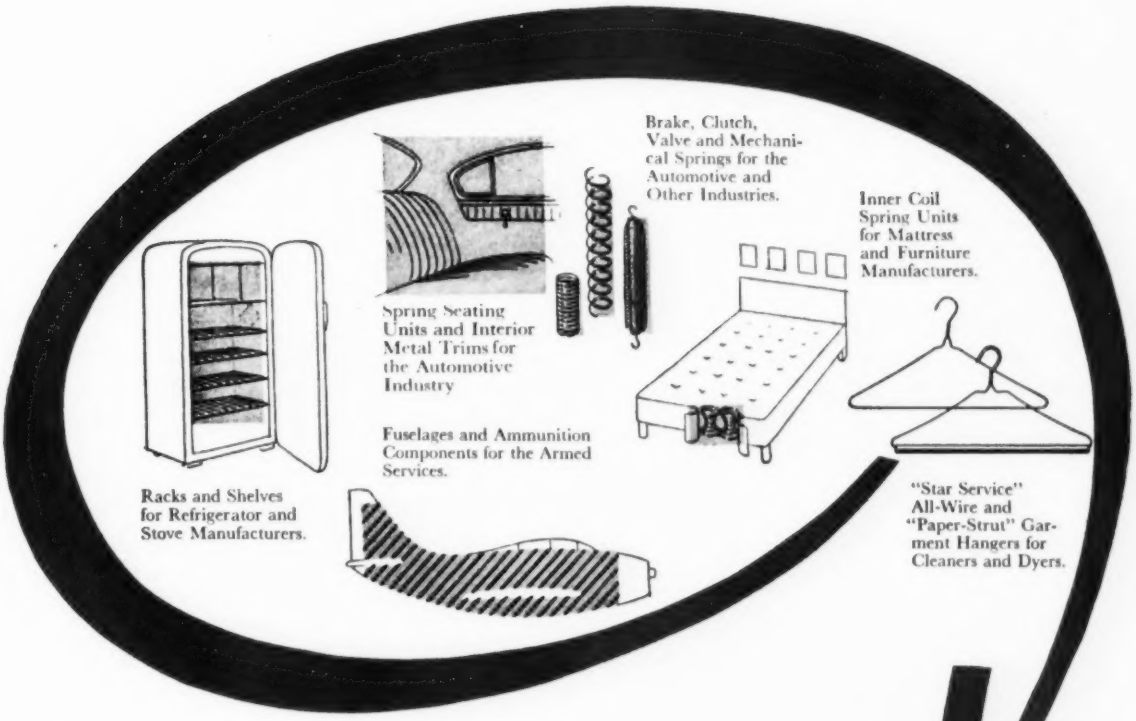
Fairchild Engine and Airplane Corp., whose fortunes have been tied solely to the twin-engine Packet cargo plane since World War II, has completed designs for a delta-wing cargo airplane capable of cruising at 500 mph. Company management has decided to finance the project out of the company's own funds since neither the services nor the airlines have any immediate plans for such an airplane. However, company president Richard S. Boutelle believes that such requirements are inevitable in the future and that development of the plane will place the company in a state of readiness far ahead of the industry when the time comes.

Backlog Up

Despite pitched battles over budgets and production lead times, the aircraft manufacturing industry has a backlog of orders totalling $18,502 million dollars, highest in its peacetime history. This tremendous quantity of orders on the books is made up of $12 billion in aircraft, $5.3 billion in engines, $300 million in propellers and the remainder in "other products and services." This backlog is up five per cent over the previous quarter and is 35 per cent higher than the same period a year ago. Military orders make up 97 per cent of the engine backlog, 93 per cent of the airplane backlog and 90 per cent of the propeller backlog.

Helicopter Passengers

New York Airways began regularly-scheduled helicopter passenger service in the metropolitan New York area July 1 with five big Silkorsky S-55 machines. The initial service is an inter-airport aerial taxi service carrying four passengers plus mail and express. NYA is operating a shuttle service between LaGuardia,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Idlewild International and Newark airports 11 times daily. While the cost of the service approximates taxi fare between the airports, the time savings are enormous: the La-Guardia-Newark airport time is eight min and the Idlewild-Newark trip is only 18 min, compared to nearly two hours by cab during the rush hours. The flights also carry NYA's regular mail, parcel post and freight services.

Reverse Thrust

The problem of slowing down the jet transport has loomed large in Government and airline discussions and it is no easy matter to solve. Because it has no propellers, these reverse-pitch devices cannot be used and all parties agree that the tail parachute used on high speed military aircraft are impractical. The French firm of SNECMA, a French Government factory, has developed a turbojet engine thrust reversing unit which directs the flow of the jet outward and forward through a series of louvres in the tailpipe. Unlike similar schemes, however, the French arrangement releases a high-pressure air flow through the center of the tailpipe, thereby forcing the lower-pressure exhaust gases out of the louvres. The company claims that the "negative thrust" produced by the device is the equivalent of approximately one-half the ful rated thrust of the engine.

CAB to Pay Bills

One of the Government's major anachronisms has long been the fact that the Civil Aeronautics Board determines the amount of mail pay due the various airlines and the Post Office Department mails out the checks. Postmaster General Arthur Summerfield has been engaged in a vigorous campaign to not only reduce mail rates but to expand mail service by air. The long delay over the action has been the combination of reluctance by the parties and the technical difficulties of separating direct mail pay from the so-called "need" pay (or subsidy) authorized U. S. airlines. Summerfield insists that the Post Office will pay the carriers only for transporting the mails—nothing more. This means that the CAB must make the subsidy payments of about $80 million, although its current budget is only about $3 million. The Board, of course, will receive an increase in its budget to the required $83 million. President Eisenhower has asked Congress to amend the 1938 Civil Aeronautics Act (which created the Board and the Civil Aeronautics Administration) "to provide specifically that compensatory rates for mail transportation be based on the cost of rendering mail service plus a fair return." It is the word "cost" that lies at the root of the problem, since an airplane may make a 2000-mile trip carrying 60-70 passengers, several tons of cargo and several hundred pounds of mail. Pro-rating the costs on a poundage basis is virtually impossible, since a large portion of airline stops are made solely for mail pickup or delivery without passengers alighting or boarding. But one thing is now certain: the Post Office Department is no longer going to pay someone else's bills, even though Government money for the purpose must be found elsewhere!

Automotive Fibres Expands in Canada

National Automotive Fibres, Inc., is expanding its operations in Canada with a 36,000 sq ft addition to its new plant at Toronto. The plant is operated by Canadian Automotive Trim, Ltd., a wholly owned subsidiary. Approximately $300,000 will be spent for buildings and equipment.

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NEW ELWELL-PARKER "Cargo Scout"

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Both systems begin with mill coil. However, if you are now buying sheet you are faced with the following costs.

For mill cutting to random lengths, simply shearing to reach sheet form, add **$.10** per hundred weight to basic steel cost.

For squaring to tolerance at the mill add another **10 percent** to your basic steel costs.

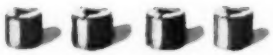
Then for wrapping and palletizing to keep the sheet clean and easy to warehouse **add an additional $.025** to the costs.

The steel, of course, must be delivered regardless of form.

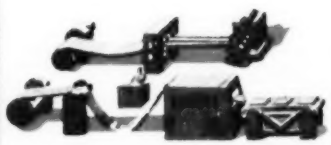
solution....A WEAN SLITTING and SHEARING

With the Wean system you buy coils, simply prepared . . . eliminate mill extras. Delivery is of comparatively few width sizes.

The fewer sizes . . . the smaller purchasing and inventory staffs required.



And you save approximately 30 percent in storage area.



The Wean Line converts the coil of steel to resquared multiples at rates up to 200 feet (or 100 cuts) per minute. Tolerance control is easily held within accepted

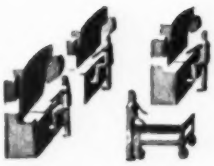
Actual Savings in Steel Costs of 20%

To many steel fabricating people this amazing speed of cutting-to-length to resquared tolerances has seemed unbelievable. But, to many others, who have seen one of these Wean lines in operation, talked with people who operate them, gone over actual figures, this is a production line "must".

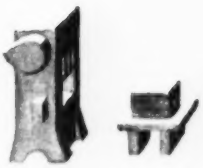
When we say savings up to 20 percent in your steel costs we mean just that. Total up the costs approximated above . . . check them against the book . . . against your own cost sheets. Find out what you're paying for getting steel from coil to final sheet size, ready to form. If it's more than a dime a hundred weight then you should know all about the Wean line. Get in touch with one of the offices listed below and let a qualified Wean representative work with you — using your figures if you wish — in proving the Wean line can effect a substantial savings where you and your operations are concerned.

Where you're buying sheets of various sizes you'll require about **30 percent more help** in your purchasing and inventory control departments.

And about **30 percent more space** in your warehousing set-up.

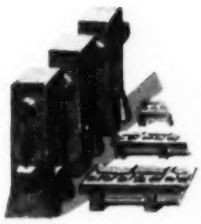


Then, if you further resquare to multiples in your own plant you're paying **an additional cost of at least $.35 per hundred weight.**



Thus, prior to fabrication, you have added approximately $1.00 to every hundred pounds of steel, even though you are using plain light gauge metal.

LINE



range. *The entire "extra" cost prior to fabrication here . . . just a fraction of the $1.00 plus per hundred weight cost of standard methods.*

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60 Deg V-6 Engine

(*Continued from page 45*)

The engine also had a secondary unbalance couple which is neutralized by a rotating couple of equal magnitude and frequency set up by a dynamic balance shaft (8 in the illustrations) with its attached unbalance weights 10 and 12 which are displaced 180 deg from each other and placed in proper phase relationship with the crankshaft. This shaft rotates in a direction opposite that of the crankshaft, and at twice crankshaft speed.

Following is the method of balancing the engine as described in the patent.

As is well-known in the crankshaft balancing art, an internal combustion engine piston connecting rod crankpin assembly sets up rotating and reciprocating forces which must be counteracted to provide smooth operation. The rotating forces set up by the connecting rod pin and lower end of the connecting rod assembly may be easily calculated and counterweighted.

The forces set up in the plane of each bank of cylinders by the reciprocating masses have an algebraic sum of zero. The sum of the primary couples set up by these forces however is not zero but forms a rocking couple in the plane of that bank.

It has been found however that if the following relationship between each pair of crankpins and the engine block V angle is adhered to, the primary rocking couples in the two banks will combine vectorially to form a rotating couple of constant magnitude:

$$\frac{\text{crankpin angle}}{2} = 90 \text{ degrees} - \text{V angle}$$

In a 60-degree V-six engine with a crankpin arrangement as here illustrated, the unbalanced primary couples in the two cylinder banks add up to a rotating couple of constant magnitude. This rotating couple is in phase with the rotating couple created by the rotating primary unbalance forces of the crankshaft and may be counterweighted together with this last mentioned unblanced couple by a single pair of counterweights 14 and 22 (in the figures.)

There are couples whose frequencies are harmonics of the primary crankshaft frequency. These are caused by the motion of the piston not being a simple harmonic motion. The couples at harmonics higher than the

(*Turn to page 136, please*)

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Muffler Inlet Pipe

This is an excellent example of Michigan workmanship in the performance of several intricate fabricating operations to most exacting tolerances.

The pipe manifold end is expanded to 2.225" I. D., a flange superimposed, and a flanged ferrule press-fitted for immediate assembly to exhaust manifold. Two bending operations with minimum reductions permit full flow of gas to hold back-pressure to a minimum. Muffler end diameter of tube is increased by expanding and a bead superimposed to form a "gas-tight" joint.

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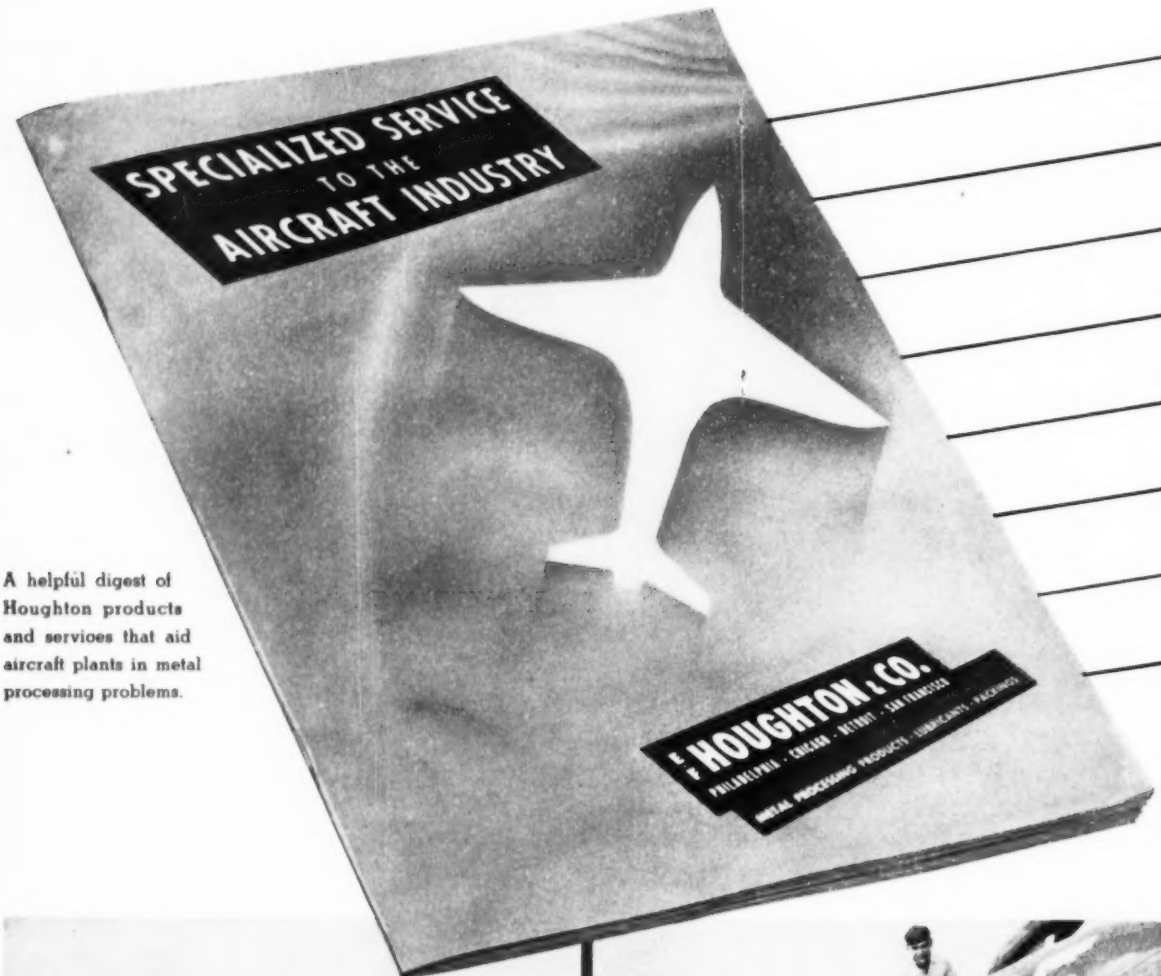

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(*Continued from page* 133)

second are of such small magnitude as to be negligible.

It has been found that by using the block angle, crank angle relationship noted above, that if a block angle satisfying the following equation is chosen, the secondary rocking couples in the two banks of cylinders combine to form rotating couples of constant magnitude.

$$\text{cosine block angle times cosine } \frac{\text{block angle}}{2} = \text{sine block angle times sine } \frac{\text{block angle}}{2}$$

This gives us a block angle of 60 degrees which also permits equal firing intervals. The secondary rotating couple thus produced is neutralized in the present invention by balance shaft 8.

In order to determine the mass of the intermediate counterweights 16, 18 and 20 to give minimum main bearing loading, a ring weight Wr is attached to each crankpin whose magnitude is given by the equation:

$$Wr = Wc + \frac{Wi}{2} + \frac{Wi}{8}\frac{(R)^2}{(L)^2}$$

Where:

Wc = rotating weight per crankpin (lower end of connecting rod)

Wi = reciprocating weight per cylinder (upper end of connecting rod and piston assembly)

R = crank radius

L = connecting rod length

A polar diagram is then made by vectorially adding the components of the gas, inertia and centrifugal forces of two cylinders in one pair with the resulting force assumed acting at the center line of the cheek or counterweight. Proper counterweights 16, 18 and 20 are then selected (these counterweights are of equal magnitude) to give a minimum peak load in the polar diagram. After thus selecting these intermediate counterweights, the end counterweights 14 and 22 may be determined by calculating the static moments of the crankshaft for these ring weights and the unbalance of the crankpins, cheeks and counterweights 16, 18 and 20. The solution of these counterweights is simplified by considering components separately in a horizontal and in a vertical plane.

The equation for the secondary couple in the present engine is:

Vertical component

$$CV = 1.5d\,\frac{WiR^2w^2}{gL}\,\sin\cdot(2\theta + 90\,\text{degrees})$$

Horizontal component

$$CH = 1.5d\,\frac{WiR^2w^2}{gL}\,\cos\cdot(2\theta + 90\,\text{degrees})$$

Where:

d = main bearing spacing

w = angular velocity of crankshaft

g = acceleration of gravity

θ = crank angle of number 1 crankpin vertical position

The above equations represent a constant rotating couple which may be conveniently balanced by a dynamic balance shaft 8 with counterweights 10 and 12 indexed at 180 degrees to induce an opposite and equal rotating couple. The dynamic balance shaft counterweight Wr required to balance the rotating secondary couple is given by the equation:

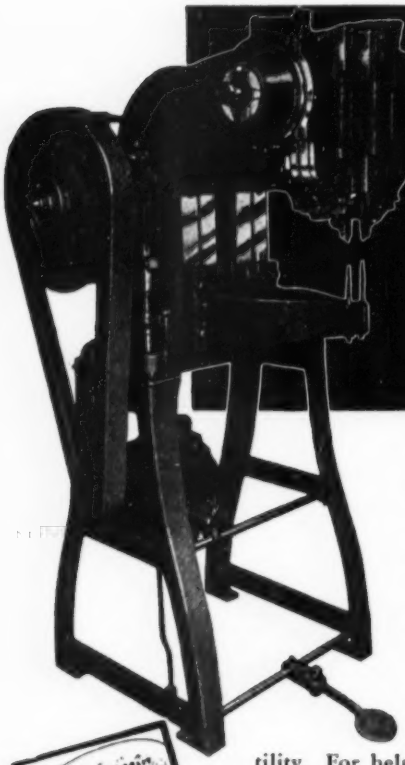
$$Wr = \frac{1.5dWiR^2}{4DL}$$

Where:

Wr = static unbalance moment of one secondary counterweight lbs. ins. around the balance shaft axis

D = longitudinal spacing of secondary counterweights on the dynamic balance shaft

The phase and direction of rotation of this dynamic balance shaft 8 are shown in Fig. 1.



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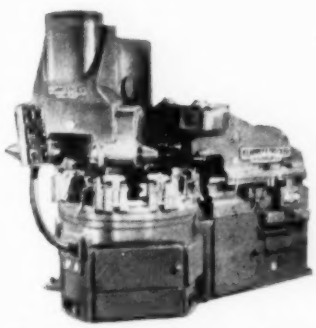
Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a three-station rotary indexing machine we designed and built for a major automotive manufacturer.

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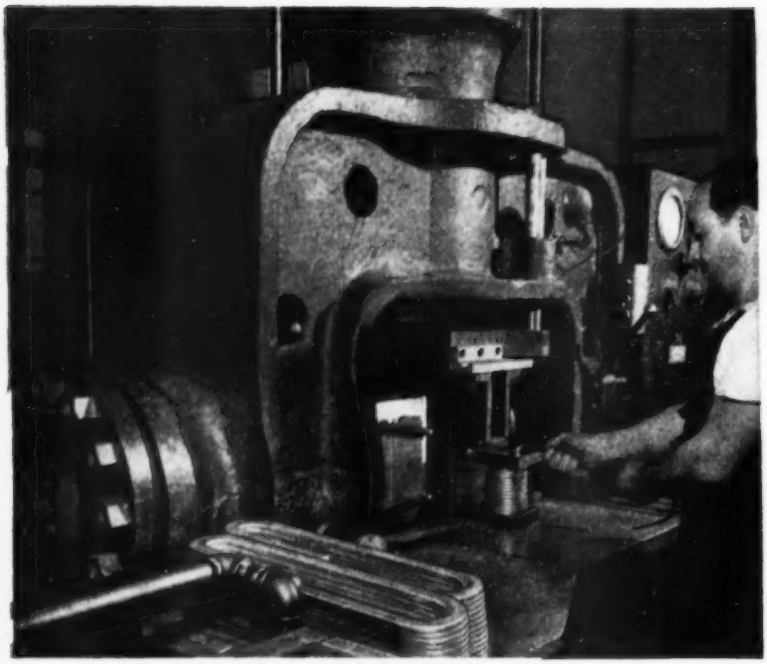

How this 2-way

FARQUHAR Hydraulic Press

forms motor and generator coils

In producing motor and generator coils from ¼ x 1-in. copper stock, the stock is first bent and the ends laminated, and then pressed to restore them to their original thickness. Then, the coil is put in this Farquhar 2-way Hydraulic Press for "pressing" the form.

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Farquhar engineers are ready to help solve whatever production problem you may have. Their expert assistance is yours for the asking. Give them a call . . . at no obligation, of course!

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HYDRAULIC PRESSES
THE OLIVER CORPORATION • A. B. FARQUHAR DIVISION

CALENDAR

OF COMING SHOWS AND MEETINGS

"Autorama"—Int'l Automobile Exhibition, 1890-1953, Million Dollar Pier, Atlantic City, N. J. Aug. 1-Sept. 15

SAE International West Coast Meeting, Georgia Hotel, Vancouver, B. C. .....Aug. 17-19

Western Electronic Show & Convention, Civic Auditorium, San Francisco, Calif. .....Aug. 19-21

National Aircraft Show and 50th Anniversary of Powered Flight, Vandalia Airport, Dayton, O..Sept. 5-7

Society of British Aircraft Constructors' Display, Farnborough .....Sept. 7-13

SAE National Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis. Sept. 14-17

Truck Body & Equipment Ass'n annual meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio....Sept. 21-23

Eighth National Instrument Conference and Exhibit, Chicago, Ill. .....Sept. 21-25

SAE National Aeronautic Meeting, Hotel Statler, Los Angeles, Calif. Sept. 29-Oct. 3

Paris Salon, France .....Oct. 1-11

38th International Motor Show, Earls Court, London .....Oct. 21-31

SAE International Production Meeting, Royal York Hotel, Toronto, Canada .....Oct. 29-30

American Society of Tool Engineers, semi-annual membership and board meeting, Dayton Biltmore Hotel, Dayton, O. .....Oct. 30-31

SAE National Transportation Meeting, Conrad Hilton Hotel, Chicago, Ill. .....Nov. 2-4

SAE National Diesel Engine Meeting, Conrad Hilton Hotel, Chicago, Ill. .....Nov. 3-4

SAE National Fuels and Lubricants Meeting, Conrad Hilton Hotel Chicago, Ill. .....Nov. 4-6

Montreal Materials Handling, Tool and Industrial Equipment Shows, Show Mart, Montreal, Que. .....Nov. 9-13

American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York, N. Y. Nov. 29-Dec. 4

1954

SAE Annual Meeting, Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Mich. .....Jan. 11-15

National Motor Boat Show, Bronx, N. Y. .....Jan. 15-23

National Transport Vehicle Show and Fleet Maintenance Exposition, New York, N. Y.....Feb. 17-19

SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. .....March 2-4

YOU'LL NEVER FIND

a quail in a quandary

The early morning meadow — emerald green and wet with dew . . . snuggled deep in the grass, listening, watching, planning — the hunter's tread sounding closer. Then . . . timing precise, they're racing the wind, a haze of brown and white.

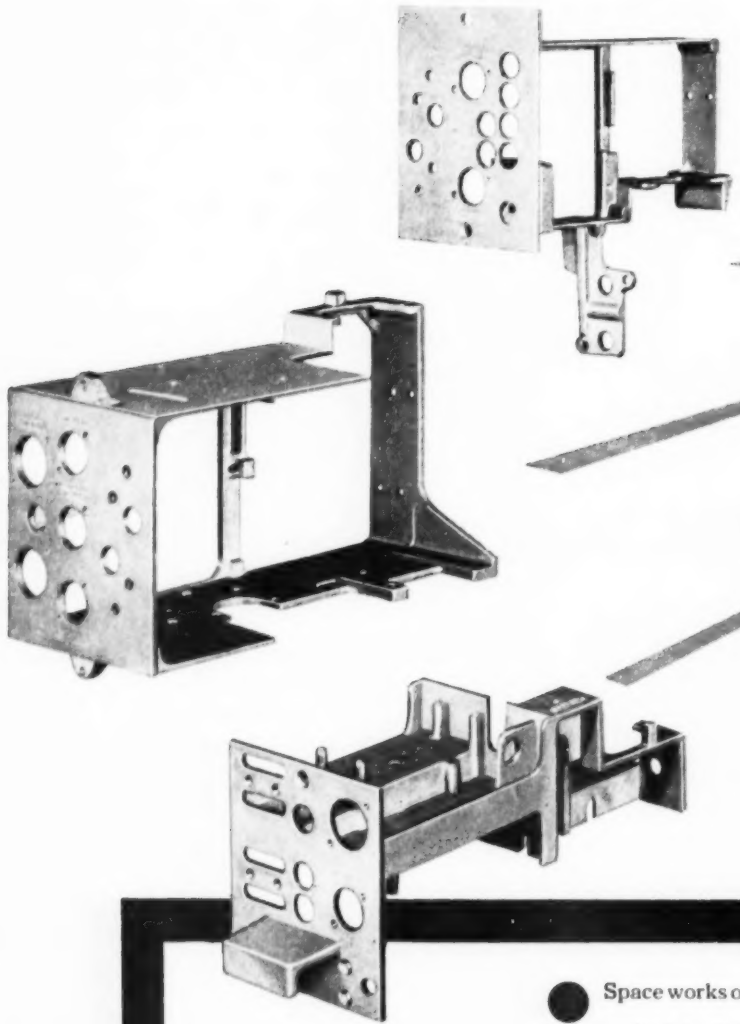
Before you fly into the building of a new product, it's smart to take the time to *plan ahead*. For planning lets you guide your moves — gives you a chance to check the advantages of castings over hard-to-work parts. Campbell, Wyant and Cannon, pioneers in metallurgical engineering, precision control and mechanized production, helps put your product out front. Castings by CWC allow you new and greater design flexibility. They wear *longer*, machine *easier* and . . . they do it all at lower cost.

Let CWC come in and help you bag a better product. It may give you the time to head for the fields and try for the limit.

CAMPBELL, WYANT AND CANNON
FOUNDRY COMPANY
Muskegon, Michigan

CWC

Since 1908



How Doehler-Jarvis make do

These Three Doehler-Jarvis Chassis Castings Nest Together . . .

form the framework for a voice channel unit (mid-ad), one of 12 housed in the N-1 Carrier Terminal shown at extreme right. The Terminal also contains 3 other sub-assemblies, different from the one shown, to mount circuits common to all 12 voice channels. In all, 39 Doehler-Jarvis die castings are used in the Terminal. Notice the complexity of the coring and the use of chassis sections to provide shielding.

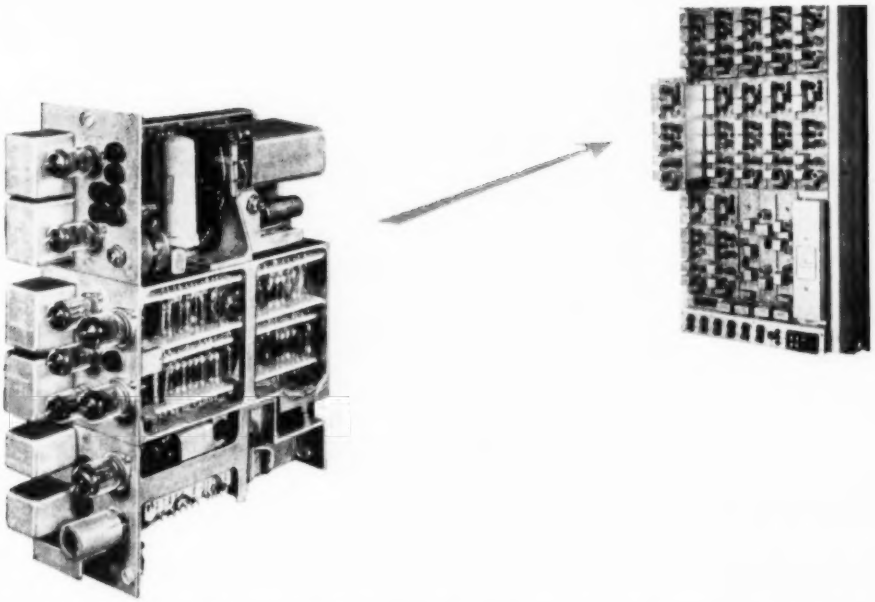
Space works overtime in America's telephone system.

And in telephone offices, the equipment which sends and receives multi-voice signals must be packed in . . . like sardines in a can.

That's the type of space conservation problem which faced Bell Laboratories' engineers, when they were told to come up with designs for the N-1 Carrier Terminal shown.

Earlier forms of similar equipment had to be simplified, then packaged in 1/6 the space to mount on standard racks. After considering several ways to do the job, it was decided to use nesting die cast aluminum chassis units. Die castings would provide dimensional accuracy, rigidity, light weight, good finish . . . and they could be formed in intricate section.

For help in establishing the most practical designs,



helped Bell Telephone Laboratories

one unit of space the work of six

Bell Laboratories called in Doehler-Jarvis right at the start. (A good thing for you to do, too.)

From then on engineers of both organizations worked as a team, pooling experience and facilities. Together, they designed die cast units which took into full account electronic requirements and used die castings to their best advantage. By so doing, much costly redesign was avoided . . . and when it came to mass production and assembly, there wasn't a hitch. Today, Doehler-Jarvis is producing the chassis units for not only the N-1 Terminal but another type of these multi-voice systems.

How About Cost? "We estimate," say Bell Laboratories' engineers, "that we recovered our die costs on the first hundred N Carrier systems by the savings over other methods of framework fabrication. This is one month's production at the present rate."

Ask Doehler-Jarvis to help you reach your design goals through skillful application of die casting. Die castings can help solve many other problems beside space conservation.

Whatever your need . . . it pays to call in Doehler-Jarvis, the company which pioneered die casting more than a half century ago. Nine plants in five cities to serve you.

Doehler-Jarvis Division

of

National Lead Company

General Offices: Toledo 1, Ohio

*Reg. U. S. Pat. Off.

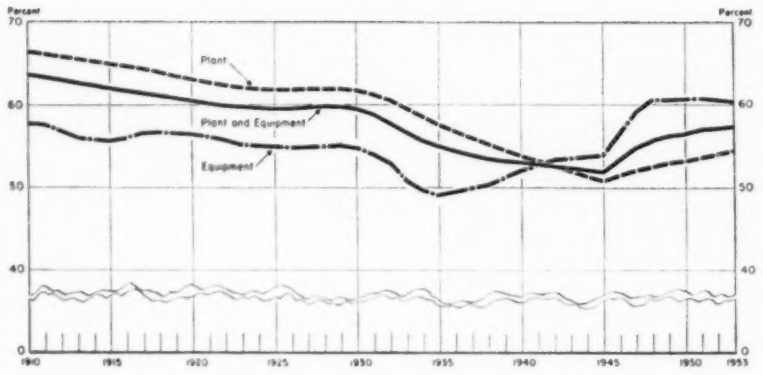
News of the

MACHINERY INDUSTRIES

(*Continued from page 63*)

Plant and Equipment Service Life

Machinery and Allied Products Institute in the latest *Capital Goods Review* has made a study concerning "Recent Changes in the Stock of Business Capital Goods." It examines the rate of growth and magnitude of the Nation's stock of capital equipment for the years 1910 to present. In so doing it provides a basis for appraising the current position and outlook for capital goods markets.



Per cent of the original service life remaining in plant and equipment survivals.

According to the report, present stocks of capital goods do not appear to be excessive. While on the basis of past experience this stock seems to be expanding at a rate that looks somewhat higher than can be regarded as indefinitely sustainable, an adjustment to a sustainable growth rate, it appears, would not involve a major decline in the rate of installations.

In appraising the capital goods outlook, the report states that it should be taken into consideration that the Nation's stock of capital goods can be expanded in the future more rapidly than in the past, and that replacement can be speeded up in relation to past practice.

The accompanying chart shows the percentage of original life remaining in plant and production equipment survivals for the 1910-1953 period. Since both plant and equipment survivals were growing continuously prior to the depression, they had over half of their original service life remaining. With the cessation of growth during the depression, the ratios gravitated downward. Since the end of the war, heavy input and rapidly rising survivals have pulled the ratios for equipment well above the predepression level. The recovery for plants has been modest, leaving the combined ratio moderately under the earlier period. It is apparent that the postwar period has seen a freshening up of capital goods stocks, reflected in a rise in the ratio of their remaining to their original service life as compared with the 1930-1945 period.

(*Turn to page* 144, *please*)

There is hardly anything in this world
that some man cannot make
a little worse and sell a little cheaper,
and the people who consider price only
are this man's lawful prey.
JOHN RUSKIN

Placed side by side, similar bushings of different make may look alike — *but are they?*

A·B·C Bushings are, and always have been made from only chromium, or chromium-tungsten oil hardening tool steels having wear resistance 18.5% greater than that of regular carbon water hardening tool steels.*

To capitalize fully on the inherent qualities of these finer steels, A·B·C Bushings are heat treated in one continuous automatic, electronically supervised operation with every step, including quenching, under a protective blanket of neutral atmosphere. This extra precaution insures high wear resistance right out to the initial working surface.

A·B·C Drill Bushings not only *last 18.5% longer,* but are *unexcelled for accuracy and concentricity.* That is why
A·B·C Bushings mean
More Holes Drilled per Dollar

A·S·A STANDARD

*See "A special American Machinist report to the metal working industries" © 1950 by McGraw Hill Publishing Company. Quoted by permission.

ACCURATE BUSHING COMPANY

MAIN OFFICE AND FACTORY:
433 North Avenue, Garwood New Jersey • WEstfield 2-6400

ENGINEERING OFFICE AND REGIONAL WAREHOUSE:
5722 W. Chicago Ave., Chicago 51, Illinois • ESterbrook 8-7180

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WRITE FOR LITERATURE AND NAME OF YOUR LOCAL DISTRIBUTOR

Handle this like a one piece ring

MUSKEGON "UNITIZED" STEEL OIL CONTROL RINGS

Here's a *multiple-piece* oil control piston ring that offers all the handling and installation speed and ease of a *one-piece* ring. It's Muskegon's *new*, exclusive "UNITIZED" piston ring with rails and spacer . . . pre-assembled . . . and BONDED TOGETHER!

You can dangle it from your finger—the components will *not* separate—not until the ring is in the engine!

Think of the time-saving benefits for both Production line and Service Shop installation.

Because it's "unitized," there's no fumbling with the components—it can be inserted like a one-piece ring, it's always *correctly* assembled assuring *right* order, and it can be compressed like a one-piece ring! Yes, sir! Whether it's handling or installation, nothing can equal the time-saving and convenience advantages of this ring.

Thoroughly field proven, the Muskegon "UNITIZED" Steel Oil Control Piston Ring is expected to become the choice of leading engine builders!

Our engineers will be happy to counsel with you. Write today. Muskegon Piston Ring Co., Muskegon, Michigan.

BONDING AGENT DISAPPEARS DURING ENGINE RUN

Muskegon uses a special, bonding adhesive that dissolves completely in the hot engine oil during the first engine run. The pieces are then free to perform as they should.

AVAILABLE WITH OR WITHOUT CHROME

CSR-200 with fully chrome plated edges assuring *double to triple ring life*. Self cleaning and non-clogging design.

CSR-100 without chrome edges. Quick seating—reduces drag to minimum—spacer well vented for free oil flow.

Muskegon "UNITIZED" Oil Control Ring consists of: spacer, two rails and heavy duty expander.

MUSKEGON Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

DETROIT OFFICES: 351 New Center Bldg.
Telephone Trinity 2-2158

TYPE F self-tapping screws

U. S. Patents
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2165010
2165011
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2161611

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THREAD CUTTING SCREWS
AIRCRAFT SCREWS
PHILLIPS
SEMS
SHEET METAL
SPECIALS

Camcar specialists have added the superior quality features of Cold-Flow processing to the time and cost-saving design of Type F Self-Tapping Screws.

The application of Cold-Flow techniques produces accuracy, tensile strength and clean dimensions to supply a stronger fastening through free-cutting, snug-fitting penetration.

Cold-Flow quality parts for Metal and Plastic Fastening applications are now available for your production with the same prompt service supplied on all Camcar Parts.

Telephone 5-9451 • Teletype RK 8653

CAMCAR SCREW & MFG., CORP.
606 Eighteenth Avenue • Rockford, Illinois

"PRODUCTION-DESIGNED FOR YOUR ASSEMBLY LINE"

News of the

MACHINERY INDUSTRIES

(*Continued from page* 142)

Gear Index

The American Gear Manufacturers Association index shows that the volume for the gearing industry decreased 12.6 per cent in May as compared with April. The index figure for May is computed to be 189.8.

Around the Industry

Milton O. Cross, Jr., president of The Cross Co., Detroit, has been named to the executive committee of the National Metal Trades Association. He will also act as regional counselor in the Detroit area.

From Bartlett, Ill., we learn that the Set Screw & Mfg. Co. has acquired from the Shakeproof Div., Illinois Tool Works, the facilities for the manufacture and sale of the line of offset self-locking set screws formerly marketed by Shakeproof. The screw will now be known as the Setko offset self-locking set screw.

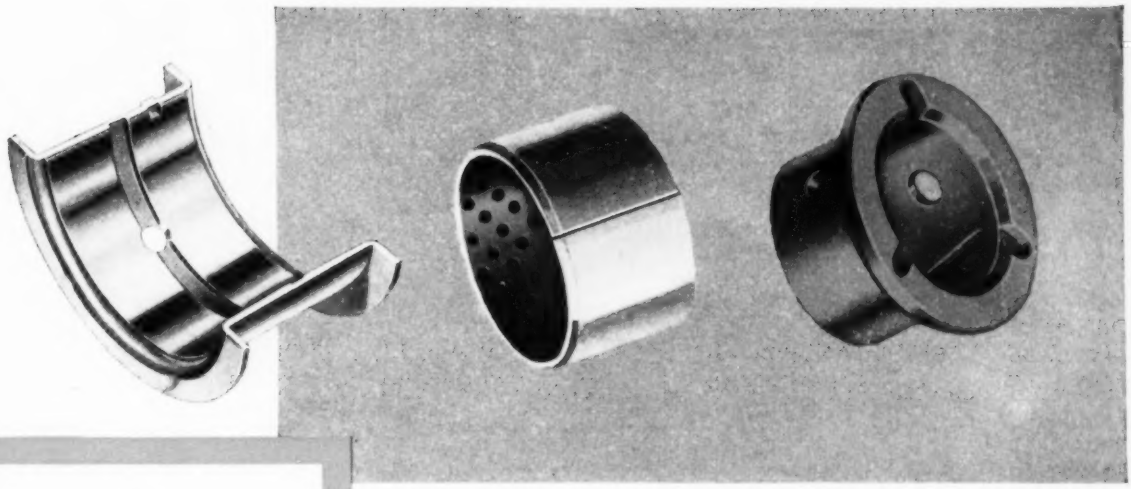
The U. S. Drill Head Co., Cincinnati, has announced that all its fixed center drill heads are now being equipped with shaved gears. According to the company, it is the only exclusive drill head builder to offer such gears. A. P. Speckin, president of the firm, stated that there would be no increase in price.

Machinery and Allied Products Institute is financing a national center at the Illinois Institute of Technology to conduct education and research in the methods of industrial equipment acquisition and replacement. The center which is to be opened this fall will offer a scientific approach to the problem.

Bryant Machinery & Engineering Co. has announced the removal of its general office to 640 West Washington Blvd., Chicago, Ill.

Safety Award

The National Safety Council's Award of Merit, one of the nation's highest industrial safety citations, was awarded to the Chrysler Detroit Tank Plant for its safety record during 1952. The plant operated more than one million consecutive man-hours without a disabling injury accident. The over-all rate of accidents during the year was reduced to 2.7 lost time accidents per million man-hours worked.



Sleeve bearings in all designs and sizes; cast bronze bushings; rolled split-type bushings; bi-metallic rolled bushings; washers; spacer tubes; precision bronze parts and bronze bars.

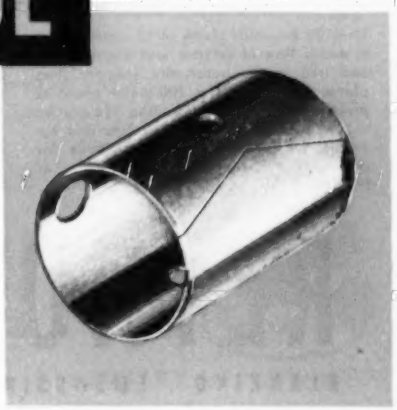
FEDERAL Mogul

SINCE 1899

FEDERAL-MOGUL

FEDERAL-MOGUL CORPORATION

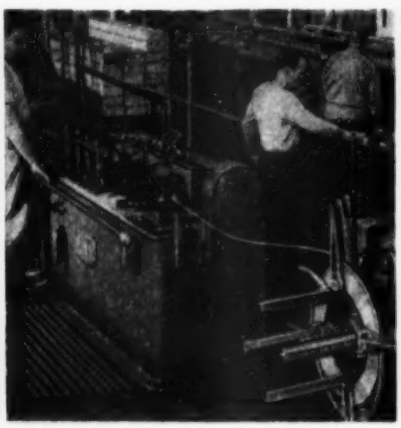
11037 SHOEMAKER, DETROIT 13, MICH.



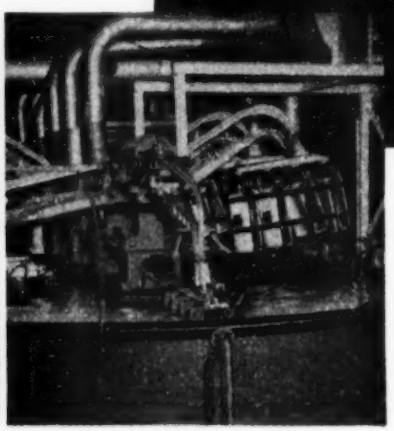
Automotive Parts and Trim

Produced to your specifications by REYNOLDS

Over 30 Reynolds plants in 18 states assure a steady flow of exterior and interior parts and trim to the automotive industry. Two plants alone have over 200 major pieces of production equipment including 128 presses—mechanical from 2 to 1700 tons and hydraulic from 300 to 5000 tons. *Write for your copy of Reynolds 24-page "Catalog of Facilities."*



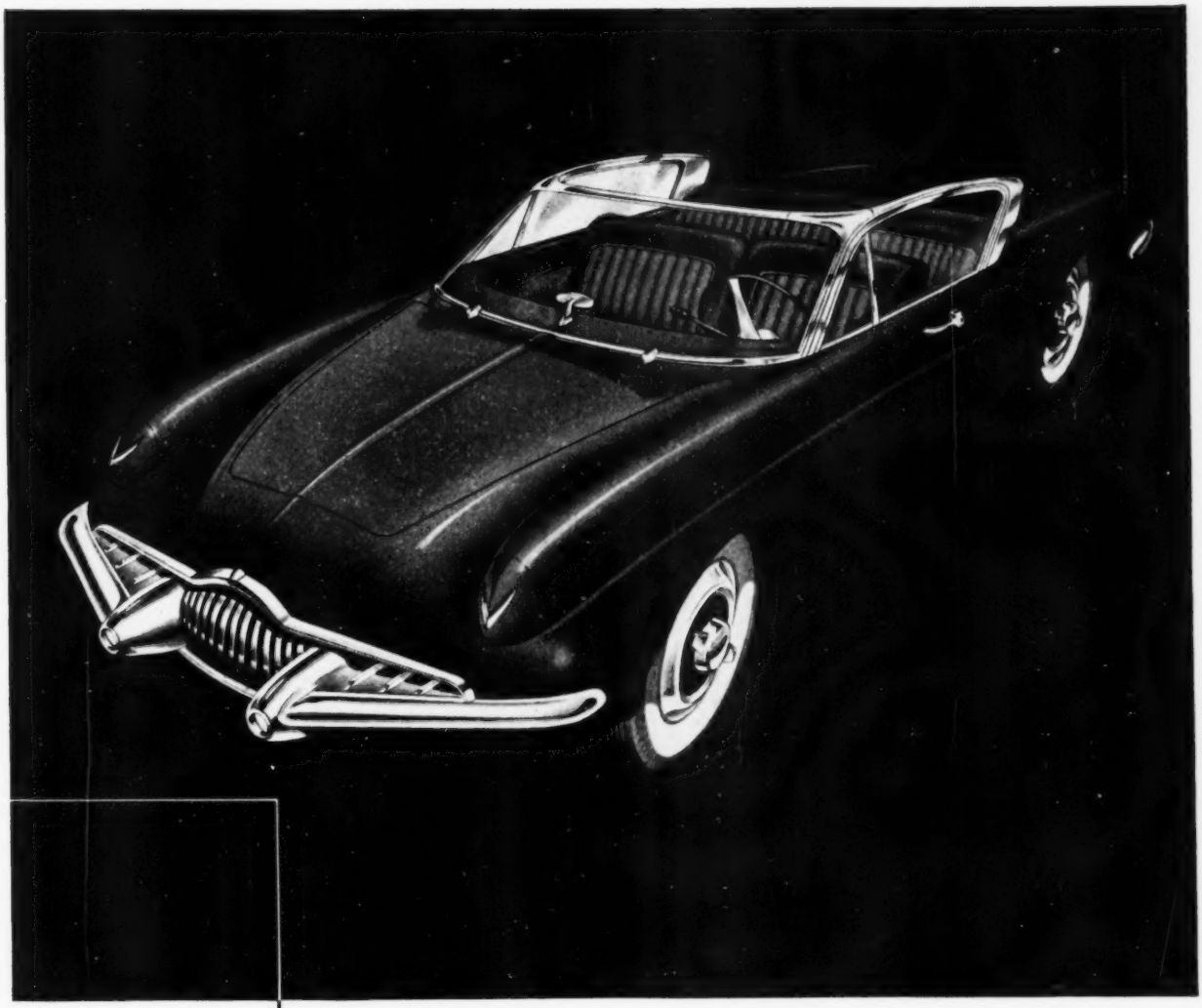
Roll formed aluminum shapes offer important benefits in economy, dimensional accuracy, better finishes and flexibility in design. Moulding strips and other exterior and interior automotive parts and trim can be roll formed by Reynolds to quality standards exceeding industry requirements. *For details, write for new catalog, "Aluminum Roll Formed Shapes by Reynolds."*



Reynolds offers superb facilities, equipment and years of experience in many diversified finishing operations. Reynolds automatic anodizing equipment, for example, assures efficient mass-production of automotive parts and trim to your specifications. Anodized aluminum parts won't rust, are more economical than most plated parts and offer attractiveness without high glare.

REYNOLDS ALUMINUM

BLANKING . EMBOSSING . STAMPING . DRAWING . RIVETING . FORMING



Experienced design and engineering help, superior production facilities and quality control from mine to finished product are three good reasons why it pays to call on Reynolds Aluminum Fabricating Service for your automotive aluminum requirements. On either stock or experimental models, the dual advantages offered by aluminum and Reynolds Aluminum Fabricating Service can help reduce your costs and improve your products.

For full details, contact the Reynolds office listed under "Aluminum" in your classified telephone directory or write Reynolds Aluminum Fabricating Service, 2087 South Ninth Street, Louisville 1, Kentucky.

FABRICATING SERVICE

ROLL SHAPING · TUBE BENDING · WELDING · BRAZING · FINISHING

More Defense Contract Awards

THIS latest list of defense prime contracts that have been awarded covers the period from May 26, 1953, to June 26, 1953. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, warplanes, automotive components and spare parts, automotive maintenance equipment, etc.

—A—

A. C. Spark Plug Div., General Motors Corp., Flint 2, Mich.
Spark Plugs—258,175—$387,263
Spark Plugs—9525—$42,672

Aero Supply Mfg. Co., Corry, Pa.
Throttle Lever Assemblies—1524—$34,549

Aerotherm Corp., Bantam, Conn.
Seat Assy.—74—$37,408

Aerotherm Corp., Thermix Corp., Greenwich, Conn.
Seat Assy.—28—$33,158

Air Associates, Inc., Teterboro, N. J.
Maintenance Parts—Various—29,264

Airesearch Mfg., Co., Div. of The Garrett Corp., Los Angeles 45, Cal.
Actuator—115—$46,520
Supercharger Drive Shaft—117—$61,-144
Valve Assys.—Various—$31,868
Motor Assemblies—$47,543

Albert-Harris, Inc., Akron 1, Ohio
Vehicle Parts—4000—$327,750

Allison Div., General Motors Corp., Indianapolis, Indiana
Turbo-jet engines—2—$32,600
Turbo-jet engines—$50,218,692

American Bosch Corp., Springfield, Mass.
Maintenance parts—Various—$26,097

American Generator & Armature Co., Chicago 32, Ill.
Vehicle Parts—25,000—$142,075

assure dependable power on this

Oil Well Drilling Rig

In isolated oil fields where water scarcity presents a terrific problem . . . only with radiators can you save and conserve water used on these giant drilling rigs. And builders of drilling rigs have found YA Sectional Cast Tank Radiators the answer for assured dependability and water conservation.

These 6 section radiators permit easy repair in the field. Any section damaged can be removed for repair, and replaced in the meantime for continued operation.

If you are a builder of heavy duty machinery, Yates-American will be glad to work with you in building radiator equipment to fit your specifications.

California Representative: E. E. Richter & Son, Emeryville, Cal.

YA
Heat Transfer Products Division
Yates-American
BELOIT, WISCONSIN
BRANCH OFFICES: CHICAGO, ILLINOIS, HIGH POINT, NORTH CAROLINA, MEMPHIS, TENNESSEE, PORTLAND, OREGON

—B—

Barber-Colman Co., Rockford, Illinois
Actuator—280—$48,801
Actuators—Various—$71,279

Bendix Aviation Corp., Red Bank Div., Eatontown, N. Y.
Regulator—289—$29,579
Inverter Assy.—86—$137,093

Bendix Aviation Corp., Pacific Div., North Hollywood, Calif.
Hydraulic Cylinder—35—$36,665
Hydraulic Actuator—180—$30,453
Hydraulic Accumulators—392—$71,024

Bendix Products Div., Bendix Aviation Corp., South Bend 20, Ind.
Valve—118—$41,961
Carburetor—$1,224,861
Wheel assys.—378—$542,882
Brake assys.—428
Maintenance parts—Various—$55,102
Spare parts—Various—$46,799
Filter assy.—9153—$35,669
Stand: Carburetor Test—Various—$141,926
Maintenance Parts—Various—$160,-161
Valve—101—$35,916
Wheel Assys.—500—$665,474
Wheel Assys.—1674—$124,284
Wheel Assy.—58—$114,136
Brake Assy.—1077—$1,048,596
Brake Assy.—267—$235,480

Boeing Airplane Co., Wichita, Kans.
Modification of Aircraft—$1,000,000

Brake Lining Supply Co., Boston 15, Mass.
Vehicle Parts—30,000—$85,170

Branden Winch Co., Broken Arrow, Okla.
Vehicle Parts—1450—$81,426

Breeze Corp., Inc., Newark, N. J.
Actuator—Various—$187,562
Lead Assys.—18,700—$92,565

—C—

Champion Spark Plug Co., Toledo 1, Ohio
Spark Plug—70,000—$105,150
Spark Plug—17,175—$25,763
Spark Plug—513,600—$698,496
Spark Plug—240,000—$729,600

Chandler-Evans Div., Niles-Bement-Pond Co., West Hartford 1, Conn.
Pump Assy.—118—$28,320

Cleveland Pneumatic Tool Co., Cleveland 5, Ohio
Drag Struts—79—$45,343

(*Turn to page* 151, *please*)

1903 1953
FIRST FIFTY YEARS
CLARK EQUIPMENT

CLARK

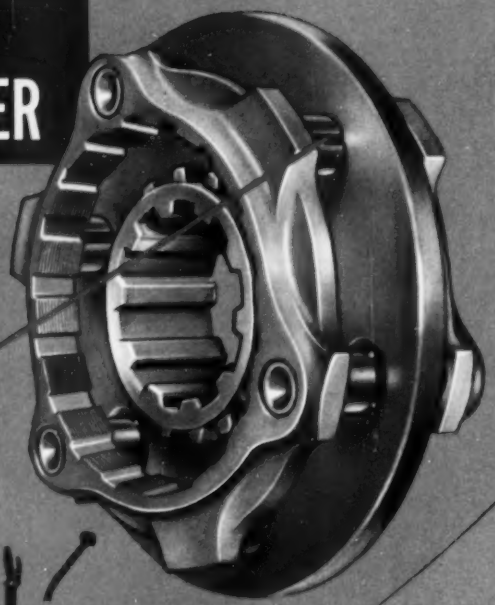
This unique housing—a one-piece, heat-treated forging—is one of the most widely used commercial axle housings. It is the result of seasoned, resourceful Clark engineering—which for you can mean substantial, product-improving benefits. It's good business to work with Clark.

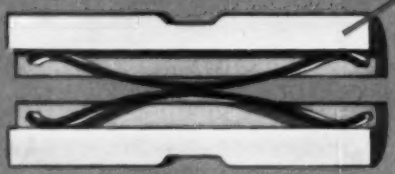
Turn and see reverse side for more about CLARK products

CLARK EQUIPMENT COMPANY, Buchanan, Michigan

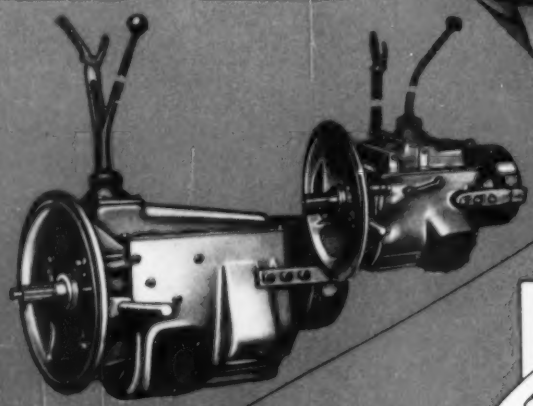
Other Plants: BATTLE CREEK AND JACKSON, MICHIGAN

THE New CLARK Split-Pin SYNCHRONIZER





CLARK transmissions are now available featuring THE "SPLIT-PIN" SYNCHRONIZER. In keeping with its traditional enthusiasm for engineering development, Clark not only builds a full range of conventional models, but specializes in designing and producing transmissions for unusual requirements for trucks, busses, farm tractors, industrial trucks and road building machinery.



Write for Products Booklet.

1903 1953 CLARK EQUIPMENT

How much did OBSOLESCENCE COST YOU TODAY?

THE FASTEST WAY for any machine to become obsolete is for someone to develop a new machine to do the same job faster, better, and more economically. That applies to fork trucks—and when it comes to constant efforts to improve our product, CLARK pleads guilty.

You owe it to yourself to know What's New (and better!) in industrial trucks. Why not let your Clark dealer give you proof?—proof that a carefully-planned modernization program will improve production and cut service costs so drastically that it will soon pay for itself.

Write for Material Handling News.

CLARK EQUIPMENT *Products* — **TRANSMISSIONS • AXLE HOUSINGS • GEARS and FORGINGS • TRACTOR UNITS • FORK TRUCKS and TOWING TRACTORS • FRONT and REAR AXLES for TRUCKS and BUSSES**

CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN

Other Plants: Battle Creek and Jackson, Michigan

(*Continued from page* 148)

Clifford Mfg. Co., Waltham, Mass.
Cooler—58—$64,320

Continental Aviation & Engr. Corp., Detroit 14, Mich.
Maintenance Parts—Various—$219,483

Continental Motors Corp., Muskegon, Mich.
Spare Parts—235,400—$113,610
Spare Parts—1300—$40,224
Facilities for AVSI-1790 Engines—$186,340
Vehicle Parts—50,000—$45,090
Continental Engines—244—$536,661

Curtiss-Wright Corp., Propeller Div., Caldwell, N. J.
Propeller Assemblies—148—$937,232

—D—

Douglas Aircraft Co., El Segundo, Calif.
Maintenance Parts—Various—$126,602
Stabilizer Assy.—17—$168,986
Parts—Various—$216,165
Parts—Various—$67,565
Parts—Various—$238,651
Protractor, Adjuster—Various—38,746

Douglas Aircraft Co., Santa Monica, Calif.
Maintenance Parts—Various—$47,573
Maintenance Parts—Various—$27,567

—E—

Eastern Industries, Inc., New Haven 6, Conn.
Pump Assys.—683—$78,909

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.
Pump Assys.—118—$64,232
Components—$5,158,253
Regulator—Various—$39,283
Bearing—74,600—$191,722
Transmitter: Oil Pressure—64—$32,788
Switch & Transmitters — Various — $28,368
Indicators—Various—$63,503
Instruments—Various—$45,511
Indicator & Transmitter—Various—$46,646
Pump Assy.—101—$54,978
Accelerometers—9306—$923,794
Generators—2880—$1,103,574
Starters—286—$75,151
Airspeed Indicators—252—$210,450
Indicator—4998—$3,882,118
Generators—848—$203,910
Maintenance Parts—Various—$45,548
Generator—60—$121,420

Electric Auto-Lite Co., Toledo, Ohio
Vehicle Parts—39,000—$197,467

Electric Storage Battery Co., Philadelphia, Pa.
Storage Batteries—4597—$210,864
Batteries—244—$202,531
Batteries—37
Batteries—425
Batteries—2318—$47,761
Battery—9000—$390,150

Erie Mfg. Co., Milwaukee, Wisc.
Cylinder Assy.—1890—$34,776

(*Turn to page* 152, *please*)

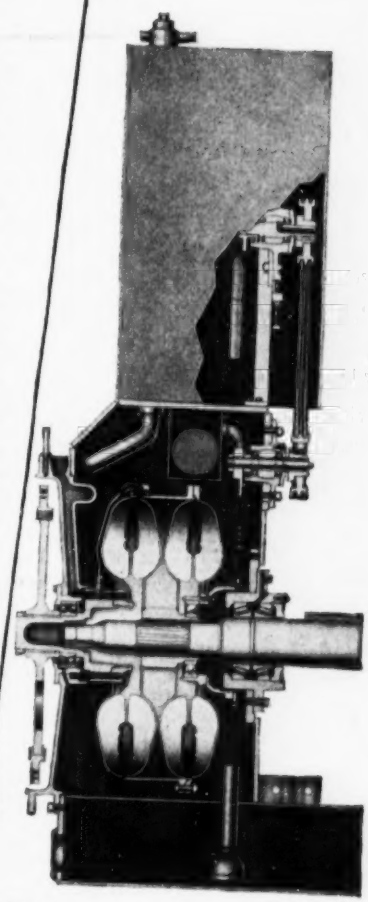
NEW Model HUD Disconnecting Hydraulic Power Take-Off . . .

Reduces Impact Shocks 70%

Doubling wear life on chains, clutches and running parts, drilling rigs equipped with the new Twin Disc Disconnecting Hydraulic Power Take-Offs have been running up outstanding service records during the past two years. Many rigs now drill deeper, more economically, because the new Twin Disc Model HUD allows the *full use of peak engine torque* . . . dampens starting shocks, stopping shocks and overloads. Through the complete Disconnect feature, the HUD acts as a master clutch.

Steady power transmission through Twin Disc HUD softens and controls speeds of acceleration and deceleration . . . to reduce impact shock—on power units *and* driven equipment—by 70% or more. Compounded drives can easily be synchronized—drum clutches can safely be engaged with engines idling, for smoother load pick-up—the range of available mud pump speeds and pressures can be greatly extended. Rig engines, free to run at their most efficient rpm, *prevented* from lugging or stalling under load, are assured of a longer, more serviceable, trouble-free life.

For complete information on how Twin Disc Disconnecting Hydraulic Power Take-Offs are adding efficiency to modern drilling rigs, contact your nearest Twin Disc Factory Branch, or write to the Hydraulic Division, Rockford, Ill.



Twin Disc Model HUD Disconnecting Hydraulic Power Take-Off—available in coupling sizes 21" and 27"; to handle 60 to 600 hp engines . . . operates with either cooling radiator or heat exchanger . . . incorporates shortened oil sump to fit rig design.

Built for a Long Life . . . Backed for a Lifetime

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin · HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND · DALLAS · DETROIT · LOS ANGELES · NEWARK · NEW ORLEANS · SEATTLE · TULSA

(*Continued from page* 151)

— F —

Fairchild Engine & Airplane Corp., Fairchild Aircraft Div., Hagerstown, Md.
Kits for Aircraft—$201,435

Fairchild Engine & Airplane Corp., Fairchild Engine Div., Farmingdale, L. I., N. Y.
Hour Meters—2000—$132,520

Fairchild Engine & Airplane Corp., Stratos Div., Bay Shore, Lone Island, New York
Cooling Package—49—$105,390
Supercharger Assy. Cooling Package—Various—$799,498
Turbine Assy.—506—$2,516,635

Firestone Tire & Rubber, Akron 17, Ohio
Vehicle Parts—16,000—$2,508,800

Fitzjohn Coach Co., Muskegon, Mich.
Vehicle Parts—19—$233,239

Foote Bros. Gear & Machine Corp., Chicago 9, Illinois
Actuators—96—$118,265
Actuator—64—$90,793
Actuators—228—$134,291

— G —

Garrett Corp. Airesearch Mfg Co., Div., Los Angeles, Calif.
Air Turbine Starters—20—$63,683

Burton . . CARRIES THE LOAD FOR ALLIS-CHALMERS

Burton Leaf Springs, installed by Allis-Chalmers and other manufacturers of heavy-duty, off-highway equipment, are recognized throughout the heavy equipment industry. They are known to be precision made to give maximum service.

Many years of growth with the motor vehicle industry have given Burton positive first-hand experience; a thorough scientific knowlege of industry needs.

Burton engineers are striving constantly to maintain and improve the efficiency of the springs that support the rolling stock of the nation. They will be happy to consult with you concerning your own spring problems.

For prompt, competent action, contact Burton today.

PUT THE BURDEN ON BURT BASCO

Burton AUTO SPRING CORP.
2433 W. 48th Street
Chicago 32, Illinois

General Controls Co., Glendale 1, Calif.
Valve Assys.—Various—$149,795

General Development Corp., Elkton, Md.
Spares—Various—$30,407

General Electric Co., Lamp Div., Phila. 4, Pa.
Lamps—Various—$35,234

General Electric Co., Philadelphia 2, Pa.
Generator—200—$96,654
Indicator—239—$313,194
Generator & Exciter Control—Various—$649,189
Generators—Various—$34,366
Maintenance Parts—Various—$47,640
Generator and Control Box—Various—$165,351

General Electric Co., Schenectady, N. Y.
Turbosuperchargers—865—$3,863,955
Regulator Systems—506—$512,560
Turbo Regulator—289—$248,507
Generators—102—$94,789
Mod. Kits—$38,441
Indicator—2017—$195,870

General Motors Corp., Allison Div., Aeroproducts, Dayton, Ohio
Special Tools & Test Equipment—$196,956

General Motors Corp., Buick Motor Div., Flint, Mich.
Transmission Assys.—430—$3,440,000

General Motors Corp., Delco Products Div., Dayton 1, Ohio
Damper—320—$35,408
Motor Assy.—16—$44,442

General Motors Corp., GMC Truck & Coach Div., East Pontiac 11, Mich.
Spare Parts—185,250—$640,381
Spare Parts—12,500—$1,246,540
Truck, Cargo—163—$1,994,533

General Tire & Rubber Co., Akron, Ohio
Wheel Assy.—514—$53,117

Gill Electric Mfg. Corp., Redlands, Calif.
Batteries—1500—$70,890
Battery—900—$63,411
600

GMC, United Motors Serv. Div., Detroit 2, Mich.
Vehicle Parts—6000—$68,850

B. F. Goodrich Co., Akron 18, Ohio
Block & Shoe Assy.—34,625—$95,441
Deicer—143—$30,624
Deicer—311

B. F. Goodrich Co., Dayton, Ohio
Wheel, Main—11,602—$6,942,843
Wheel Assy.—536—$63,234

Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio
Stationary Disc—55,936—$115,955
Wheel Assys.—160—$332,448
Wheel Assy.—270—$152,669
Wheel Assy.—107—$29,763
Maintenance Parts—35,000—225,572
Wheel Assy.—1259—$203,447
Wheel Assy.—1000—$1,732,399
Wheel Assy.—1000
Brake Assy.—1232
Brake Assy.—1161—$241,199
Brake Lining—25,416—$35,786

Gould-National Batteries, Inc., Depew, N. Y.
Batteries—4673—$202,574
Battery—9000—$390,150
Battery—3000—$116,496

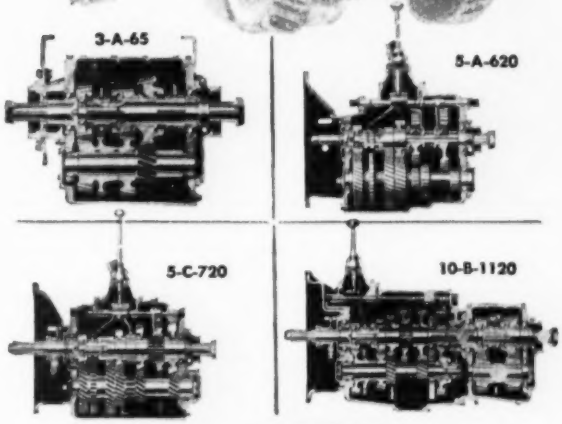
(*Turn to page* 154, *please*)

Where hp *really* goes to work!

Fuller offers the most complete line of heavy duty transmissions available — more than 100 models—for every heavy duty application using internal combustion engines.

There's a Fuller unit or auxiliary transmission for any application—from two tons to the biggest —to provide exactly the *right gear ratios* for your job—to help your driver keep the engine turning at its most effective speed . . . to assure faster trips —higher average speeds.

That's why you see the Fuller name plate on the gear boxes of more and more trucks and industrial machines. Demand transmissions from the *Fuller* line to get maximum performance from *your* rigs.



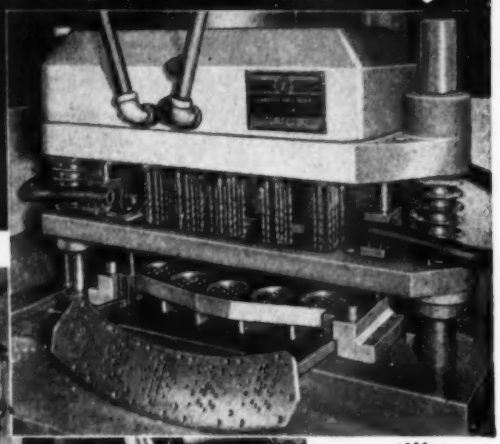
where horsepower *really* goes to work

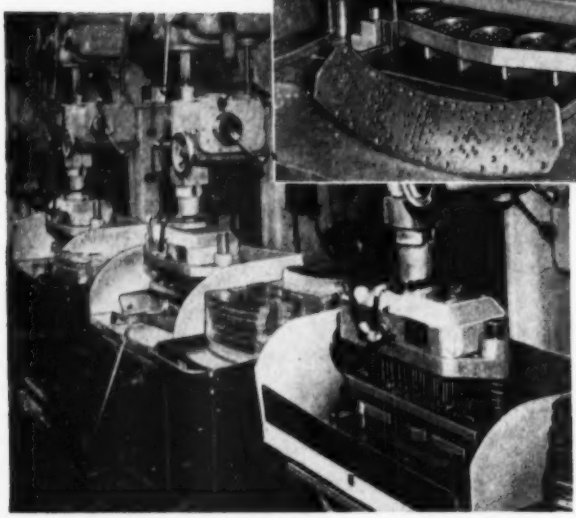
Fuller TRANSMISSIONS ®

FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO 13F, MICHIGAN

Unit Drop Forge Division, Milwaukee 1, Wis. • WESTERN DISTRICT OFFICE (SALES & SERVICE—BOTH DIVISIONS), 1060 E. 11th Street, Oakland 6, Calif.

UNITED AIRCRAFT chooses Zagar engineered drilling for J-47 Jet Engine Parts





Zagar evolves best method for drilling 383 holes in header plates and manifold for liquid-to-liquid heat-exchanger. Photographs by courtesy of UNITED AIRCRAFT PRODUCTS, INC., Dayton, Ohio.

The job: to save most time and money in drilling 365 holes .200 diameter and 18 holes 5/16" diameter. Zagar *engineered drilling* licked it.

● You, too, can profit from the often demonstrated ability of Zagar gearless drillheads to drill hundreds of holes at one pass. Zagar's engineered drilling permits record-breaking performance without drill breakage. Used alone or combined into 4-post machines, Zagar gearless drillheads drill any material and any size hole on all centers as close as twice the drill diameter. No application is too difficult for Zagar standard machines 16", 24", 32" and 40", or for special machines to fit your needs exactly. All this, at a new low cost of tooling.

Ask for Zagar Catalog "U-7"

ZAGAR TOOL, INC.

24000 LAKELAND BLVD. • CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

(*Continued from page* 152)

Great Lakes Mfg. Corp., Hammond, Ind.
Canopy Assy.—$57,419
Grimes Mfg. Co., Urbana, Ohio
Parts—Various—$257,468

—H—

Herman Nelson Div., American Air Filter Co., Inc., Moline, Ill.
Preheater—73—$50,339
Hiller Helicopters, United Helicopters, Inc., Palo Alto, Calif.
Transmission Assy.—30—$166,806
Parts—Various—$540,884
Holley Carburetor Co., Detroit 41, Mich.
Spare Parts—Various—$59,687
Spare Parts—Various—$76,725
Spare Parts—Various—$283,685
Governor Drive Shaft—5752—$104,284
Spare Parts—20,000—$73,200
Carburetor Spare Parts—$70,695
Hotpoint Co., General Electric Co., Chicago, Ill.
Turbosupercharger—339—$4,294,636
Houdaille-Hershey Corp., Houde Engineering Div., Buffalo, N. Y.
Shimmy Damper—56—$41,135
Damper Assy.—190—$154,925
Hydro-Aire, Inc., Burbank, Calif.
Filter, Assy.—275—$31,331

—I—

Independent Auto Radiator Mfg. Co., Chicago 16, Ill.
Vehicle parts—2500—$57,250
Industrial Machine Co., Shreveport, La.
Vehicle Parts—3500—$47,215
Ingersoll-Rand Co., Phila. 3, Pa.
Spare Parts—Various—$34,855
International Harvester Co., Washington 5, D. C.
Vehicle—21—$41,232
Vehicle Parts—7—$34,710

—J—

Jack & Heintz, Inc., Cleveland 1, Ohio
Control Box—Various—$49,735
Inverter—1426—$419,121
Generators—718—$351,571
Starters—1469—$331,484
Generator—3458—$78,047
Actuator Assy.—764—$333,706

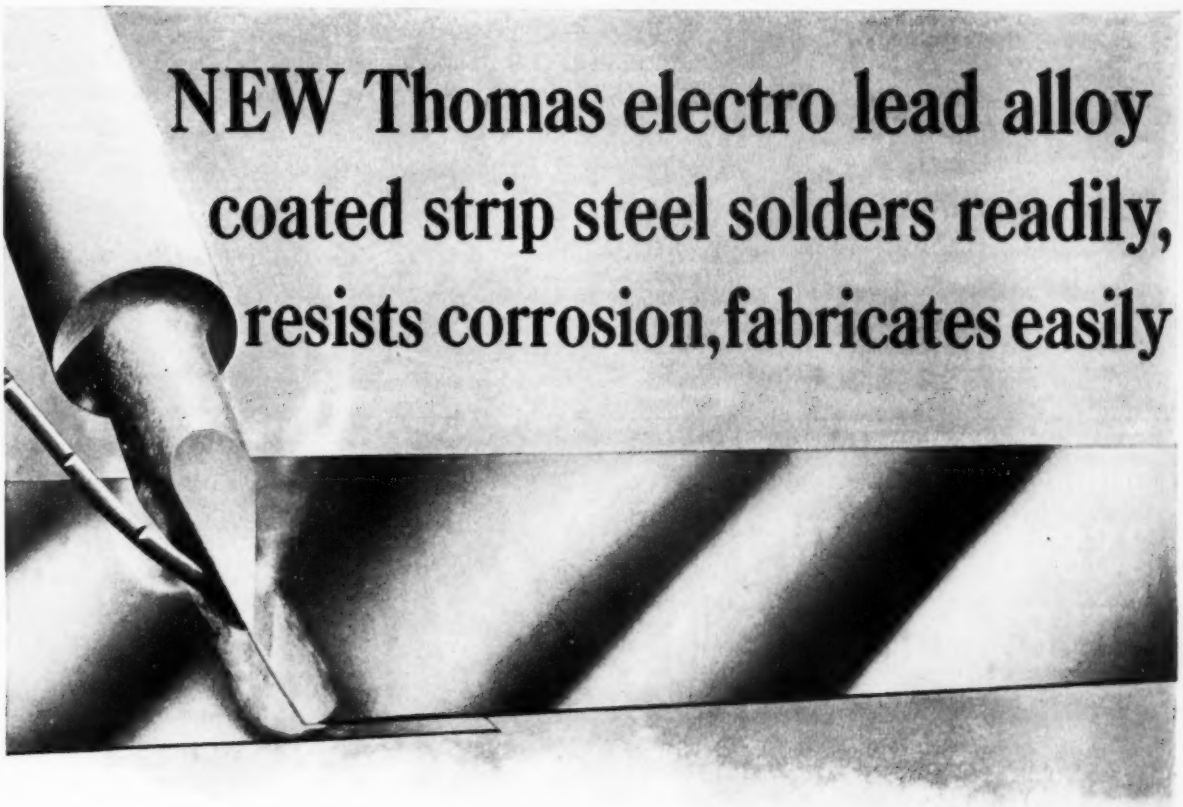
—K—

Kollsman Instrument Corp., Elmhurst, New York
Airspeed Indicators—2419—$510,226
Airspeed Indicators—6389—$1,325,530
Indicators—160—$40,513
Machmeters—4368—$1,758,423
Airspeed Indicator—252—$108,244
Pressure Altimeter—$1,005,200
Pressure Altimeter—$46,510

—L—

Lackner Co., Cincinnati, Ohio
Indicator—837—$32,887
Laher Spring & Tire Co., Oakland, Calif.
Vehicle Parts—9000—$37,800
Lear, Inc., Grand Rapids, Michigan
Spare Parts—22—$73,972
Shafts—Various—$90,391
Spares—Various—$92,381
Spare Parts—$1,771,543
(*Turn to page* 156, *please*)

NEW Thomas electro lead alloy coated strip steel solders readily, resists corrosion, fabricates easily



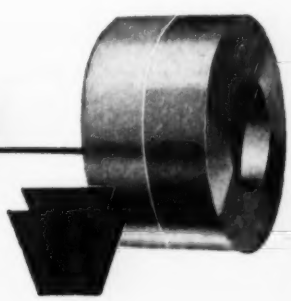
The newest addition to the Thomas family of pre-coated steels—*electro-plated lead alloy cold rolled strip steel*—gives you another method of improving your products and reducing your costs. The homogeneous and dense lead-tin alloy coating provides excellent resistance to corrosion, improves the soldering and spot welding qualities of the strip.

The ease with which Thomas Electro-coated lead alloy can be soldered without an acid flux and with a minimum consumption of solder is a distinct advantage to the fabricator. It retains its solderability over a considerable period of time. The coating also provides an excellent base for paints and synthetic enamels and acts as a lubricant in drawing operations.

Thomas Electro-coated lead alloy is available in the gauge range of .005 to .050 up to 20" in width. For information on this new product and the other economical Thomas pre-coated steels listed below, write today.

Cold-rolled strip steel electrolytically pre-coated with Zinc, Copper, Brass, Nickel and Lead-Alloy in Natural, Planished and Buffed Finishes—Hot Dip Tin and Lead-Alloy Coated—Lacquer Coated in Colors—Annealed Spring Steel—Alloy Strip Steel—Uncoated Strip Steel. Carefully produced to your specifications.

Thomas Strip



Thomas Strip Division

Pittsburgh Steel Company • Warren, Ohio

(*Continued from page* 154)

Lear, Inc., Romec Div., Elyria, Ohio
Motor Assys. & Pump Assy.—Various—$105,351
Pump Assys.—Various—$105,249
Leece-Neville Co., Cleveland 14, Ohio
Parts—Various—$41,218
AC Generators—68—$142,979
Libbey-Owens-Ford Glass Co., Toledo, Ohio
Window Assemblies—$61,464
Glass Windshield Armor—$111,724
Liquidometer Corp., Long Island City 1, N. Y.
Relay and Tank Units—Various—$39,897
Lockheed Aircraft Corp., Burbank, Calif.
Tank Assy.—Various—$123,186
Conversion—2—$59,780
Installation of Ejection Seats—205—$230,000

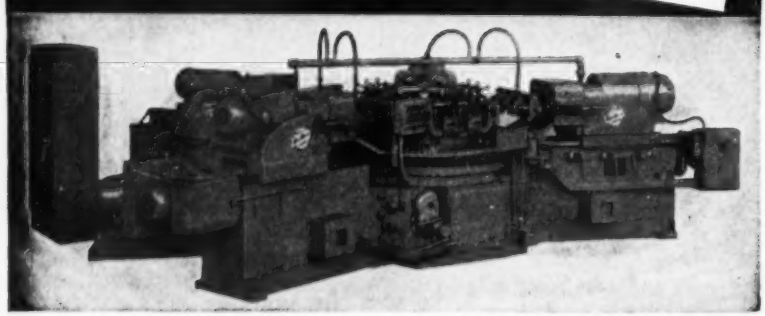
— Mc —

McDonnell Aircraft Corp., St. Louis 3, Mo.
Spare Parts—Various—$83,046
McQuay-Norris Mfg. Co., St. Louis 10, Mo.
Vehicle Parts—10,000—$34,150

— M —

Marotta Valve Corp., Boonton, N. J.
Valve Assy.—Various—$37,845
Glenn L. Martin Co., Baltimore 3, Md.
Maintenance Parts—Various—$61,883
M. B. Mfg., Co., Inc.
Maintenance Parts—900—$69,736
M. D. Mfg. Co., Inc., New Haven, Conn.
Mount Assy.—5625—$497,278

Drilling and Reaming
388 KING PIN HOLES PER HOUR



Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

DAVIS and Roto-Matic THOMPSON

Davis & Thompson Company
6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

Minneapolis-Honeywell Regulator Co., Minneapolis, Minnesota
Indicator—1139—$5,396,061
Control—1082
Monroe Auto Equipment Co., Monroe, Mich.
Vehicle Parts—9000—$29,250
Motor Truck Parts Co., Detroit 21, Mich.
Vehicle Parts—10,000—$48,924

— N —

North American Aviation, Inc., Columbus Div., Columbus 18, Ohio
Spares—Various—$88,748
Parts—Various—$47,986

— P —

Pacific Div., Bendix Aviation Corp., North Hollywood, Calif.
Hydraulic Accumulators — Various — $31,688
Parker Appliance Co., Cleveland, Ohio
Valves—Various—$89,439
Pesco Products Div., Borg-Warner Corp., Bedford, Ohio
Pump Assys.
Piasecki Helicopter Corp., Morton, Pa.
Spare Parts—Various—$37,669
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Window Assemblies—$44,989

— R —

Reo Motors, Inc., Lansing, Mich.
Spare Parts—11,000—$1,992,590
Rochester Products Div., General Motors Corp., Rochester, N. Y.
Regulators—222—$69,687

— S —

Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y.
Maintenance Parts—Various—$43,421
Maintenance Parts—Various—$75,274
Magneto Spare Parts—$53,252
Ignition Analyzer Assy.—1163—$2,316,380
Exciter Ignition Units—369—$167,987
Sperry Gyroscope Co., Div. of Sperry Corp., Great Neck, N. Y.
Indicators—Various—$253,861
Components Parts—Various—$269,699
Unit Power Control—192—$31,814
Steiner Plastics Mfg. Co., Glen Cove, L. I., N. Y.
Dome—924—$73,499
925
Studebaker Corp., South Bend 27, Ind.
Vehicle Parts—7000—$55,954

— T —

Ternstedt Div., General Motors Corp., Detroit, Mich.
Indicator—$238,954
Ternstedt Div., GMC., Plymouth, Mich.
Indicator—1329—$961,032

— U —

United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.
Gear—Various—$58,123
Parts—Various—$64,755
Spare Parts—20—$68,460
Spare Parts—235—$367,443
Shaft Assy.—Various—$28,608
Maintenance—Various—$50,469

(*Turn to page* 160, *please*)

Check list for better engine timing

✻ ☐ Automatic joint snugness ✻ ☐ Smoother operation ✻ ☐ Longer life

You get all 3* with Link-Belt Timing Chain

Why segmental bushings provide automatic joint snugness

Segmental bushings are made with slight bow.

After initial assembly in chain, bushings are straight.

Bow in bushing acts to keep a snug joint, maintaining chain pitch automatically.

WHEN you design with Link-Belt Timing Chains and Sprockets, you get exclusive engineering extras that result in smoother operation, longer life. Take a look at the accompanying sketches. They show you how Link-Belt's Segmental Bushings assure automatic joint snugness.

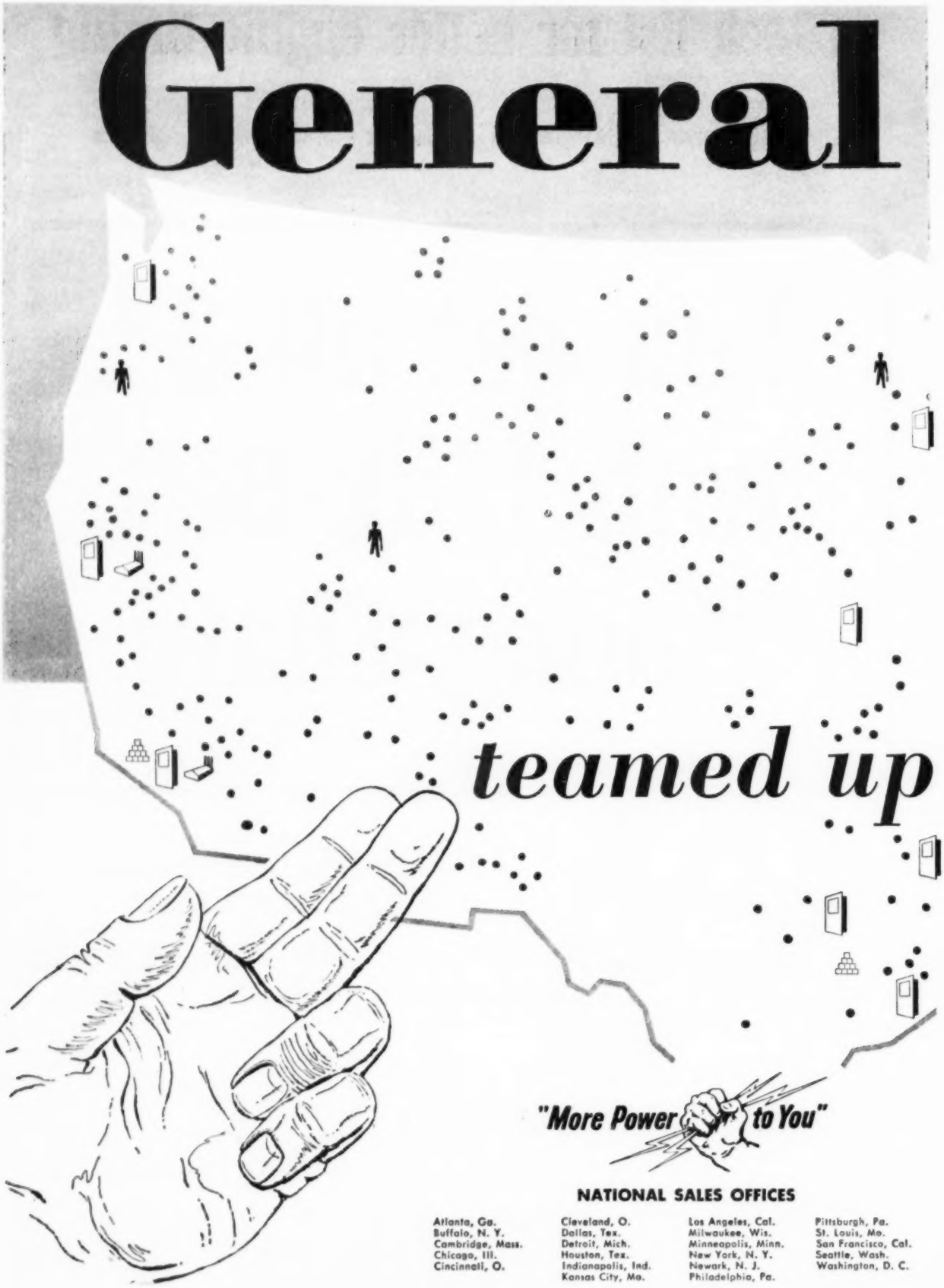
Put the continuing research and unsurpassed facilities of the vast, new Link-Belt plant to work for you. Engineering and specification details are available in Book 2065.

LINK-BELT

TIMING CHAINS and SPROCKETS

LINK-BELT COMPANY: 220 South Belmont, Indianapolis 6, Ind. Offices in principal cities. 12,741

General



teamed up

"More Power to You"

NATIONAL SALES OFFICES

Atlanta, Ga.	Cleveland, O.	Los Angeles, Cal.	Pittsburgh, Pa.
Buffalo, N. Y.	Dallas, Tex.	Milwaukee, Wis.	St. Louis, Mo.
Cambridge, Mass.	Detroit, Mich.	Minneapolis, Minn.	San Francisco, Cal.
Chicago, Ill.	Houston, Tex.	New York, N. Y.	Seattle, Wash.
Cincinnati, O.	Indianapolis, Ind.	Newark, N. J.	Washington, D. C.
	Kansas City, Mo.	Philadelphia, Pa.	

Cable

FOR QUICKER SERVICE anywhere in the United States...General Cable maintains

- 22 Sales Offices
- 14 Resident Sales Representative Locations
- Over 600 Distributor Sales Locations
- 6 Regional Stock Distribution Points
- 6 Manufacturing Plants and Stocks

to render service!

General Cable is an institution that stands for nation-wide service points, strategically located . . . Field Offices to render on-the-spot service . . . Teamed with important supply houses to put General Cable products on a local delivery basis from local distributing points.

Whatever your electrical wire and cable need, whenever you need it, make "General Cable" a part of your product description.

One Source of Complete Supply
One Completeness of Service
One Standard of Quality

GENERAL CABLE
CORPORATION

Executive Offices: 420 Lexington Avenue, New York 17, N. Y. Sales Offices in Principal Cities in the United States.

Use this CHECK CHART to Select PRODUCTION Sockets

REGULAR LENGTH SOCKETS	HEXAGON OPENINGS	3/16" to 7/16"	5/16" to 3/4"	3/8" to 1-1/4"	1/2" to 1-1/2"	1/2" to 1-11/16"	3/4" to 3-5/8"	1-5/16" to 3-1/2"
	SURFACE DRIVE OPENINGS	----	3/8" to 9/16"	7/16" to 7/8"	5/8" to 1-1/4"	----	----	----
	DOUBLE SQUARE OPENINGS	5/16" to 7/16"	5/16" to 5/8"	3/8" to 1"	9/16" to 1-1/8"	9/16" to 1-1/4"	3/4" to 2-3/4"	----
BOLT CLEARANCE LENGTH SOCKETS	HEXAGON OPENINGS	1/4" to 3/8"	5/16" to 5/8"	3/8" to 1"	9/16" to 1-1/16"	9/16" to 1-5/8"	3/4" to 2-3/8"	----
	SURFACE DRIVE OPENINGS	----	3/8" to 9/16"	7/16" to 13/16"	5/8" to 1"	----	----	----
	DOUBLE SQUARE OPENINGS	----	----	----	----	----	3/4" to 2-3/8"	—
SPECIAL SOCKETS FOR HARDENED TAPPING SCREWS	REGULAR	3/16" to 3/8"	5/16" to 9/16"	3/8" to 9/16"	----	----	----	----
	WITH CARBIDE INSERTS	1/4" to 7/16"	5/16" to 1/2"	----	----	----	----	----
ACCESSORIES AND ATTACHMENTS	EXTENSIONS (Lengths)	2" and 6"	3" and 6"	5" and 10"	6" and 10"	7", 10" and 13"	6" and 12"	6" and 12"
	HEX-SQUARE SHANKS (Size Hex)	1/4"	7/16"	7/16" or 5/8"	5/8" or 3/4"	3/4"	3/4"	----
	MAGNETIC SHANKS (Sockets to Fit)	1/4" to 3/8"	----	----	----	----	----	----
	ADAPTERS	----	----	----	----	3/4" F 1" M	1" M 3/4" F	----

This condensed chart can be used as a quick reference in selecting Williams IMPACT "Supersockets"® and accessories for assembly and maintenance work. In the complete line of over 500 sockets and accessories you will find adaptions for all types of power wrenches... impact, or single and multiple nut runners. They can also be used with Williams hand drivers.

• Our latest catalog gives you complete details on these and other tools in the broad quality line by Williams. Your industrial supplier can meet your requirements from local stocks.

You can get Catalog A-100 through your Industrial Distributor or by writing direct.

J. H. WILLIAMS & CO.
528 Vulcan Street, Buffalo, N.Y.

(*Continued from page 156*)

United Aircraft Corp., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Spare Parts—Various—$330,876
Spare Parts—Various—$190,413
Pump & Pipe Assy.—Various—$358,962
Spare Parts—Various—$1,893,359
Coupling Assy.—Various—$165,429
Spare Parts—Various—$411,283
Spare Parts—Various—$207,375
Spare Parts—Various—$121,642
Spare Parts—Various—$142,733
Spare Parts—Various—$6,961,489
Parts—Various—$119,519
Spare Parts—Various—$30,536
Spare Parts—Various—$262,400
Spare Parts—Various—$25,121
Spare Parts—Various—$30,967
Spare Parts—Various—$25,579
Tools—Various—$127,400
Spare Parts—Various—$277,814
Spare Parts—Various—$38,930
Parts—Various—$799,790

United Aircraft Corp., Sikorsky Aircraft Div., Bridgeport, Conn.
Winterization Kits—25—$45,746

U. S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa.
Transmitter—439—$64,816
Indicator—168—$46,897

—V—

Vickers, Inc., Detroit 32, Mich.
Relief Hydraulic Valve—152—$42,070
Accumulator—59—$26,733

—W—

Warner Div., Detroit Harvester Co., Detroit, Mich.
Control Assy.—52—$42,143
Valve Assy., Brake—62

Waukesha Motor Co., Railway Div., Waukesha, Wis.
Maintenance Parts—Various—$30,783

Western Engine & Supply Co., Hollywood, Calif.
Crankcase Assy.—299—$48,438

Westinghouse Electric Corp., Philadelphia 4, Pa.
Alternator—Various—$65,430

Weston Hydraulic, North Hollywood, Calif.
Valve—160—$77,471

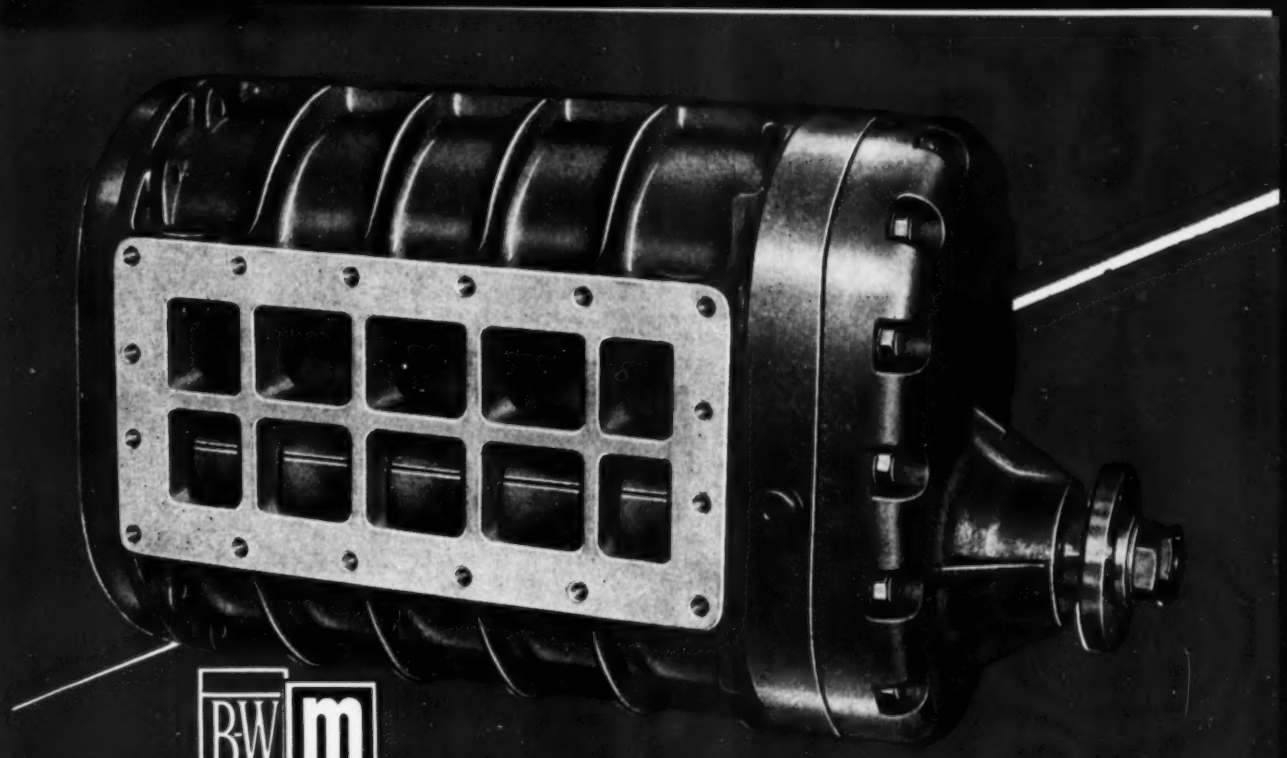
Winchester Repeating Arms Co., Div. of Olin Industries., New Haven 4, Conn.
Jet Igniter Cartridge—50,000—$63,500

Wohlert Corp., Lansing, Mich.
Vehicle Parts—1620—$74,617

Bendix-Skinner Starts New Detroit Plant

Bendix-Skinner Div. of Bendix Aviation Corp. has started construction of a new 73,000 sq ft plant on a 23-acre site in a northern Detroit suburb. The new plant will be used to consolidate activities of the company's current four separate facilities into a single production unit.

Bendix-Skinner produces air, fuel, and lubricating and hydraulic oil filters for the aircraft, automobile, and industrial fields. Bendix acquired the Skinner Company in 1947.



B-W m-d

A NEW NAME FOR A famous Supercharger

MIEHLE-DEXTER supercharger boosts power, decreases weight-to-horsepower ratio on leading Diesels.

Extra Power to Pull Heavy Loads! Power that means less engine space, less weight per horsepower and more *usable* horsepower. That's supercharging with performance-proved M-D supercharger.

Lab tested for efficiency at Borg-Warner's supercharger laboratory, it's the same supercharger proved for staying power, efficiency and low maintenance service on leading Diesels.

Exclusive Features Improve Performance. The M-D supercharger's exclusive end plate design and tip insert reduce rotor end clearance and improve engine fuel economy. Lightweight 3-lobe rotor cuts vibration and allows high speed safely . . . to improve efficiency.

m-d

Specify standard M-D models for your applications from 100 to 750 h.p. Or for special requirements consult your M-D engineer.

For more facts write Miehle-Dexter Supercharger Division, Racine, Wisconsin.

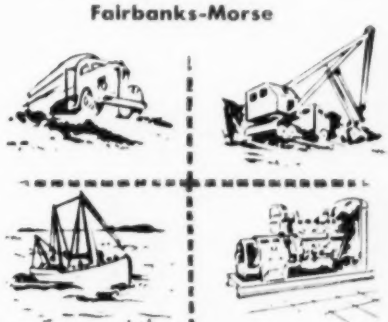
FIELD TESTED ON LEADING DIESELS

The M-D supercharger has won universal acceptance on engines produced by many of the leading Diesel Engine manufacturers, including the following:

Buda **Cummins** **Murphy**

Venn-Severin **Hercules**

Fairbanks-Morse



The M-D positive displacement supercharger is now engineered and produced by the Miehle-Dexter Supercharger Division of the Dexter Folder Company. The Division maintains complete servicing and repairs for new superchargers and for the thousands now in operation.

MIEHLE-DEXTER SUPERCHARGER DIVISION

100 FOURTH STREET • RACINE, WISCONSIN

New Products

For additional information please use postage-free reply card on page 73

(*Continued from page 72*)

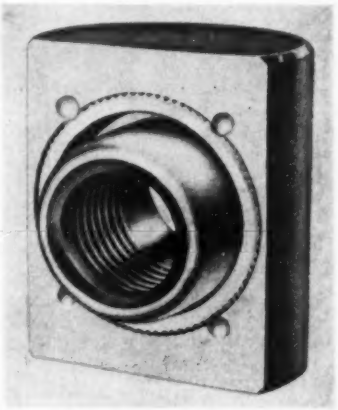
Floating Barrel Nut

Recently introduced is a floating barrel nut which is said to assure faster, tighter bolting. Known as Flo-Nutt, it reportedly eliminates the milling of large recesses for wrench clearance and is self-aligning to allow faster assembly.

In cases where a number of matched drilled holes in one pattern are required, it is claimed that the unit saves tooling expense, since looser limits of the bolt hole can be set up with a variance of 1/64 of an in. in any direction. This variance is possible through the self-aligning feature which allows the nut to shift within the barrel.

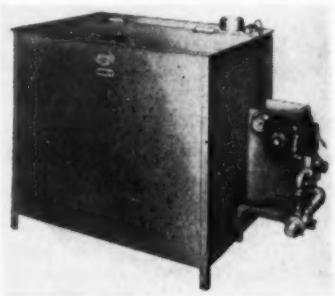
The nut has an anodized aluminum alloy body with a cadmium-plated steel retainer. It is available in a wide range of bolt sizes from ¼-28 to 1½-12 with a minimum tensile strength of 5.760 lb to 272,000 lb. *A. A. Metal Products, Inc.*

Circle P-16 on page 73 for more data



Radiator Cleaning Vat

Now being offered is a newly designed vat for hot chemical cleaning of radiators. Designated as Model "O" Hot Vat, the unit is said to combine all the basic features of previous models at less cost.



The vat holds up to three average size radiators and is rated by the manufacturer to clean up to ten radiators in an eight-hour day. Gas-heated units are equipped with an immersion burner. The vat can also be equipped for steam or electricity.

Construction is of prime quality steel, bottom and sides are double-walled with one in. of insulation between walls. All seams are welded inside and out. *Inland Manufacturing Co.*

Circle P-17 on page 73 for more data

Fuel Pump Gaskets

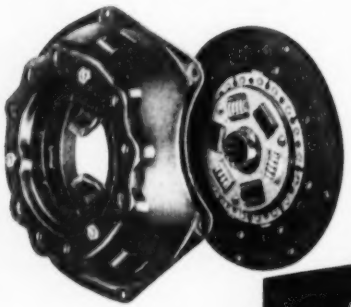
Now available is No. GA200 fuel pump gasket assortment. Designed

(*Turn to page 166, please*)

You can depend on —

BORG & BECK®

CLUTCHES . . . for that vital spot where power takes hold of the load!



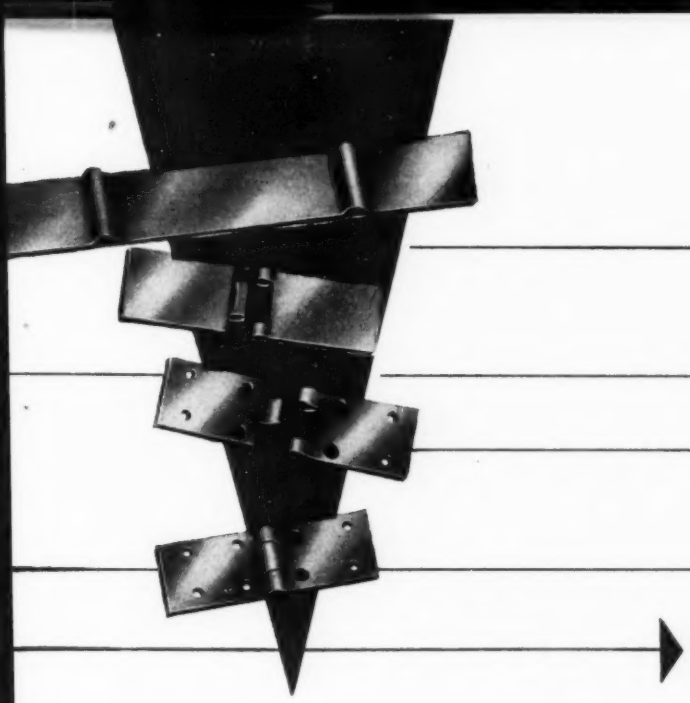
Engineered by BORG & BECK means . . .

CLUTCHES EXPERTLY DESIGNED AND PRECISION BUILT BY CLUTCH-MAKING SPECIALISTS!

BORG & BECK CLUTCH · THE STANDARD · Reg. U.S. Pat. Off.

ENGINEERING B-W PRODUCTION

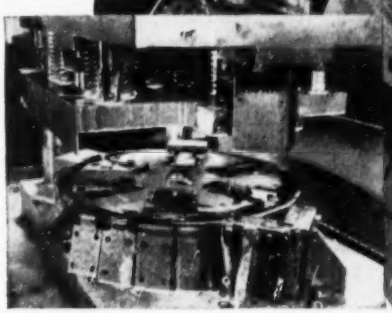
BORG & BECK DIVISION
BORG-WARNER CORPORATION
CHICAGO 38, ILLINOIS



Profits Hinge on Steady Production?

Here's a heavy-duty job that Clearing O.B.I. presses are taking in stride. The Steel Parts Corp., Tipton, Indiana mass produces automotive door hinges from continuously fed strip. The strip, purchased with regularly spaced lobes, is ⅜" thick, ¾" thick at the lobe. Both hinge sections are blanked in a single operation. Later operations on Clearing O.B.I. presses form the hinge joint and punch the mounting holes.

Production is continuous except for feeding interruptions. Rough work for an O.B.I.? Just the kind that Clearing presses with their husky all steel welded frames are built for. When profits hinge on steady production, call on Clearing Machine Corporation.



Another Clearing O.B.I. punches mounting holes. In this closeup of the die area, you can see the punched hinge sections.

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION, 6498 West 65th St., Chicago 38, Illinois • HAMILTON DIVISION, Hamilton, Ohio

You know that brake, gasoline, and oil lines of Bundyweld Tubing are leakproof, completely dependable. You've probably taken advantage of Bundy's complete fabrication services or specialized engineering help.

And now: custom-engineered packaging of fabricated or straight-length Bundyweld brings your plant new handling convenience, additional savings.

Your fork-lift trucks handle these new pallet packs easily, speedily; stack them to almost any height (above). New packaging, compared with once-standard method (inset), prevents tube damage, part tangling, saves handling costs.

And now: Bundy custom-engineered packaging eases handling, saves costs

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness,

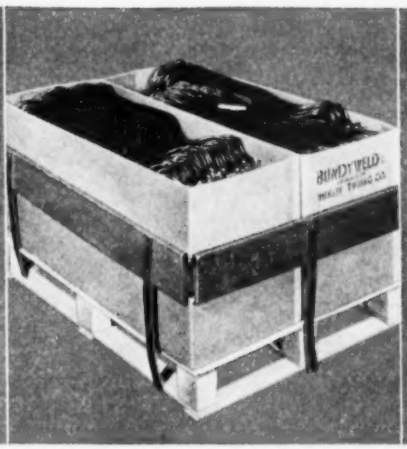
and passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

← **NOTE** the exclusive patented Bundyweld beveled edges, which afford a smoother joint, absence of bead and less chance for any leakage.

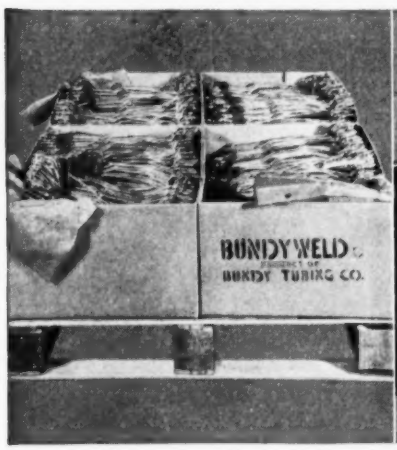
Bundy Tubing Distributors and Representatives: ***Cambridge 42, Mass.:*** Austin-Hastings Co., Inc., 226 Binney St. • ***Chattanooga 2, Tenn.:*** Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • ***Chicago 32, Ill.:*** Lapham-Hickey Co., 3333 W. 47th Place • ***Elizabeth, New Jersey:*** A. B. Murray Co., Inc., Post Office Box 476 • ***Philadelphia 3, Penn.:*** Rutan & Co., 1717 Sansom St. • ***San Francisco 10, Calif.:*** Pacific Metals Co., Ltd., 3100 19th St. • ***Seattle 4, Wash.:*** Eagle Metals Co., 4755 First Ave., South ***Toronto 5, Ontario, Canada:*** Alloy Metal Sales, Ltd., 181 Fleet St. East • **Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.**

Custom-engineered packages are made up by selection of the properly sized corrugated "component" for particular parts. Vacuum windshield-wiper tubes ship and store most safely, economically in one-component packs. Wooden "girth" fastened about component during packing assures alignment on pallet, prevents bulging. Tubes are bound in groups to prevent tangling.



Best shipping, storage efficiency is gained by sizing components exactly to each different Bundyweld part. Eleven styles are used, ranging from 23½" x 17½" x 10" up to 47½" x 35½" x 32". Two components carrying these armored brake tubes fit squarely on a 36" x 48" expendable, four-way-entry pallet, won't shift in transit whether stapled or banded.

New handling, storage ease is seen sharply in packaging of these tinned Bundyweld heater tubes. Kraft components (every one certified by 275-600-lb. test) permit this pallet pack, with total weight of 1500 lbs., to carry 2000 tubes. Old shipping method involved separate handling of 80 loose bundles. Despite weight, new pack is handled easily by fork-lift.

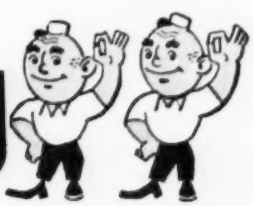


Care taken in Bundy packaging, delivery is seen in the palletizing of this four-component pack of brake tubes. Wooden corner-inserts help reinforce package in transit, add extra strength at right places for increased stackability in storage. Tubing is protected against rubbing or possible moisture seepage from all inserts by covering of treated semi-liner.

Custom-engineered packaging adapts deliveries to exact needs. For storage and production flow on multiple-shift basis, a customer needed small, easily handled components that could be taken from pallets individually. Solution: six-component pack, units banded to pallet without stapling. Corrugated cover for whole pack defeats shifting problem, adds protection.

Bundyweld fabricated parts or straight-length tubing can be used with efficiency directly from shipping package. On shipments for local-area customers, Bundy's own truck fleet delivers the order right on schedule in these heavy-duty, steel returnable containers. Smaller sizes than those above can be raised to working height by using standardized metal stands.

Bundyweld Tubing ®

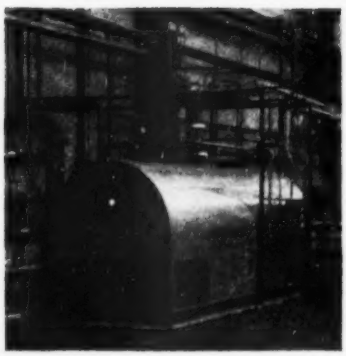


DOUBLE-WALLED FROM A SINGLE STRIP

Yours for REDUCED FIRE LOSSES

CARDOX Experience

The Priceless "EXTRA" You Don't Pay for in CARDOX Low Pressure Carbon Dioxide Fire Extinguishing Systems*



EXPERIENCE is the one thing that can't be copied.

CARDOX originated and created Low Pressure Carbon Dioxide Fire Extinguishing Systems many years ago.

Since then CARDOX has installed thousands of successful Systems — has held steadfastly to its never-ending research and engineering program for the continuous betterment of CARDOX fire protection.

As a result, CARDOX' experience and knowledge of low pressure carbon dioxide and its application are unapproached—literally years ahead.

This is the priceless "extra" that comes to you with every CARDOX System.

Approved by:
Underwriters' Laboratories, Inc.
Manual Systems—1940
Automatic Systems—1941

Factory Mutual Laboratories
Manual Systems—1942
Automatic Systems—1942

***First Installation*—1939**
Thousands of Systems since, for most of the nation's leading corporations and industries.

*** Covered by U. S. and foreign patents, issued and pending.**

CARDOX CORPORATION

BELL BUILDING • CHICAGO 1, ILLINOIS • *District Offices in Principal Cities*

New Products

For additional information please use postage-free reply card on page 73

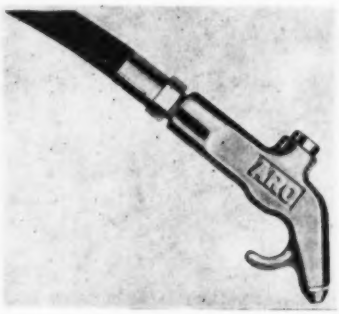
(*Continued from page* 162)

for use by service stations, garages, etc., it is said to keep all well-known fuel pump gaskets available in one convenient place. *Airtex Automotive Div., Airtex Products, Inc.*

Circle P-18 on page 73 for more data

Blow Gun

Recently announced is a blow gun designed with a throttle valve that is said to meter air pressure exactly with finger-tip control. Valve can also be set for fixed pressure.



The gun is suitable for cleaning jobs in shops, foundries, paint shops, machine shops, construction, production lines, inspection, shipping, and many other uses. It is simple in design, shaped to fit the hand, and built with one-piece cast housing. *Aro Equipment Corp.*

Circle P-19 on page 73 for more data

Industrial Cement

Now available is a quick-setting thermoplastic cement for general industrial use. Known as F-88, it is said to require no air for setting completely hard, ready for finishing, in a very short time.

The cement permits joining of metals, wood, plaster, porcelain, stone, concrete, and glass. It is adaptable for such applications as gluing, bonding, filling, and sealing. It will not shrink, expand, crack, or change shape, the manufacturer states. *Industrial Div., American Consolidated Dental Products Co.*

Circle P-20 on page 73 for more data

(*Turn to page* 169, *please*)

"What goes on here, Mr. Beaver?"

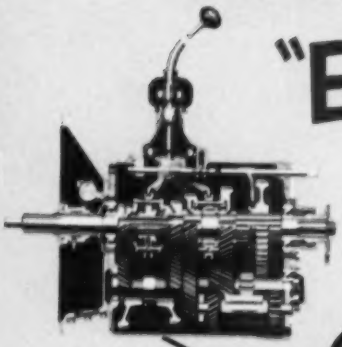
Operation *completely submerged* . . . army trucks travelling under many feet of water . . . accomplishing missions impossible without such 100% amphibious ability!

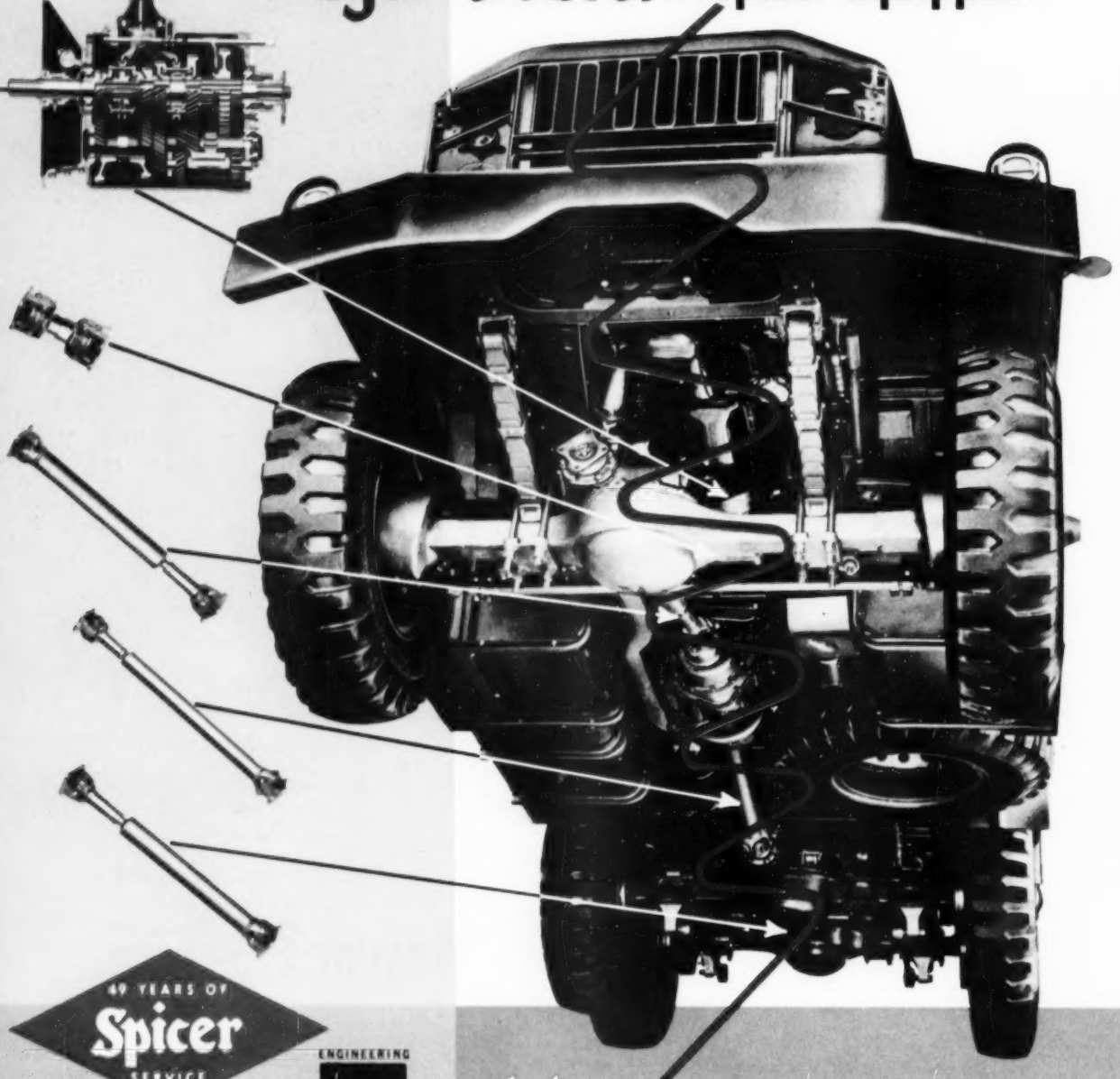
Among the new military vehicles, these versatile 2½-ton trucks are the most revolutionary and efficient. On land or 10 feet under water, their dependable and uninterrupted service is achieved with the aid of Spicer Fully-Synchronized Transmissions, Spicer Propeller Shafts and Spicer Universal Joints.

Designing, Developing, Engineering, Manufacturing and Service

Spicer

Ambitious amphibious "Eager Beaver"...Spicer-equipped





49 YEARS OF Spicer SERVICE

ENGINEERING

MANUFACTURING

SPICER MANUFACTURING DIVISION
of Dana Corporation • Toledo 1, Ohio

TRANSMISSIONS • UNIVERSAL JOINTS • BROWN-LIPE AND AUBURN CLUTCHES • FORGINGS • PASSENGER CAR AXLES • STAMPINGS • SPICER "BROWN-LIPE" GEAR BOXES • PARISH FRAMES • TORQUE CONVERTERS • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • WELDED TUBING

Call it the *Main Artery*. Call it the *Life Line*. Call it any name that describes the driving flow of power delivered through the Spicer Transmission, Propeller Shafts and Universal Joints in the new completely amphibious Army trucks.

These time-proved Spicer products have been serving civilian and military needs in large volume for many years in trucks, buses, tanks, and other vehicles. Spicer is geared to big production of Fully Synchronized Transmissions and other power delivery units, to meet your requirements for greater economy and ease of operation in commercial vehicles.

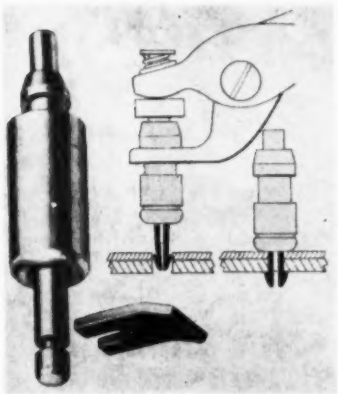
New Products

For additional information please use postage-free reply card on page 73

(*Continued from page* 166)

Metal Fasteners

Now on the market is a line of metal fasteners for holding materials such as templates, jigs, sheet metal, small fittings, etc., in place during drilling, riveting, fabrication, and assembly. They are applied from one side of the work and reportedly can be used over and over again.



Fasteners of both spring-actuated and hand-operated wing-nut types are available in a variety of sizes and capacities. *Wedgelock Co.*

Circle P-21 on page 73 for more data

Propeller Shaft Socket

Now available is a special socket to fit the propeller shaft pinion nut on International Truck Models L-110, L-120, and some K-Line models. The socket has a 1¼ in. 12-point opening and a ½ in. square drive to fit standard socket handles. *Owotonna Tool Co.*

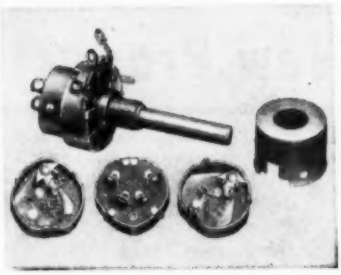
Circle P-22 on page 73 for more data

Head Lamp Assemblies

Now available is a line of head lamp assemblies for GM, Chrysler, Willys and Ford products.

Parts included in the assemblies are said to be accurately sized to meet the requirements for each individual car model. *Auto Lamp Manufacturing Co.*

Circle P-23 on page 73 for more data



Miniature Switches

Several new miniature switches for attachment to their types LP and LR or other standard variable composition resistors (volume controls) have been announced. They are said to be only ⅞ in. at their widest diameter and 9/32 in. deep exclusive of terminals.

The A-10, a dp-st switch is rated three amp at 125 v or one amp at 250 v ac-dc. Type A-15 is rated one amp, at 125 v ac-dc.

Another switch, the A-11, is sp-st rated three amp at 125 dc v or five amp at 125 ac v. *Electronic Components Div., Stackpole Carbon Co.*

Circle P-24 on page 73 for more data

(*Turn to page* 170, *please*)

JOHNSON

Tappets

"fill the exacting requirements of today's engines"

Higher horsepower and higher compression put heavier loads on the tappets. Johnson quality assures you the performance you want from these vital engine parts.

"Tappets are our business"

JOHNSON Jp PRODUCTS INC.

MUSKEGON, MICHIGAN

made by
MASTER CRAFTSMEN
to insure
Matchless Performance

MASTER
SERVICE PARTS

CLUTCH RELEASE BEARINGS
Finest materials and workmanship assure less friction, longer wear.

WATER PUMPS
Lifetime-lubricated bearings. Patented long-life seals. Vacuum-tested.

TIE ROD ENDS
Four ways better! Rolled Threads, Phosphor Bronze Seat, Patented Ball Bearing Construction, Neoprene Washer and Dust Shield.

OTHER MASTER BRAND QUALITY PRODUCTS
Front End Suspension Parts • King Bolt Sets • Front Wheel Bearings
Hydraulic Brake Parts • Hydraulic Brake Hose • Stop Lite Switches
Fuel Pumps Parts and Distributors

MASTER PARTS DIVISION
AIRTEX PRODUCTS INC.
FAIRFIELD ILLINOIS

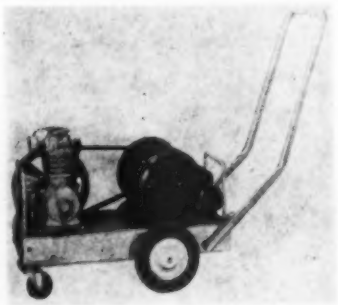
New Products

For additional information please use postage-free reply card on page 73

(*Continued from page* 169)

Compressor Unit

Now on the market is a tank-in-base portable compressor unit which is said to offer compactness as well as high-volume air delivery. Designated as the X8M, the unit is described as easy to lift, maneuver, and transport, even over rough ground.



Compression is twin cylinder type, with choice of ¾ or one-hp electric motor. The latter type drives the compressor at 835 rpm to deliver 5.76 cfm of air at 55 to 65 lb working pressure.

A gasoline-powered model is also offered featuring slightly greater air deliveries than the one-hp electric model. *Sharpe Manufacturing Co.*

Circle P-25 on page 73 for more data

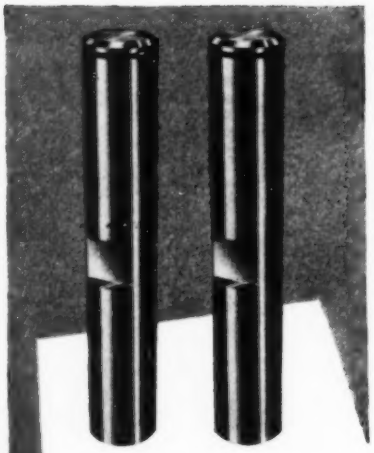
Clearance Lights

Designed to meet special safety lighting requirements of trucks, trailers and buses, two clearance light units are now being marketed. The two new units, representing popular styles in heavy demand, serve to "round out" the Pathfinder selection of automotive lighting equipment.

No. CL-667 is a hooded unit with a chrome-plated shield that concentrates the marker light for greater visibility. No. CL-665 is a single clearance light with a flexible strap mounting. Lamp hangs free, suspended by a strap of sturdy rubber fabric between lamp and mounting bracket.

Both units are constructed of heavy gage steel. Brackets come complete with all necessary wiring and bulbs. The lights are said to be vapor, moisture, dust and waterproof. *Auto Lamp Manufacturing Co.*

Circle P-26 on page 73 for more data



Which Twin is the Phony?

It Might be Worth a Fortune to Know
—IN ADVANCE!

One of these "twins" (could be any kind of part or material) is perfectly good—the other worthless. Why? Because one has a tiny crack that went unseen until *final* inspection and had to be scrapped. Could this happen in your plant?

If you knew *in advance* that certain parts or materials were defective, would you waste processing time, labor and money on them?

NOW YOU CAN KNOW, thanks to the fast, positive inspection methods developed by Magnaflux Corporation for cost-cutting process control.

WRITE US—We'll show you how.

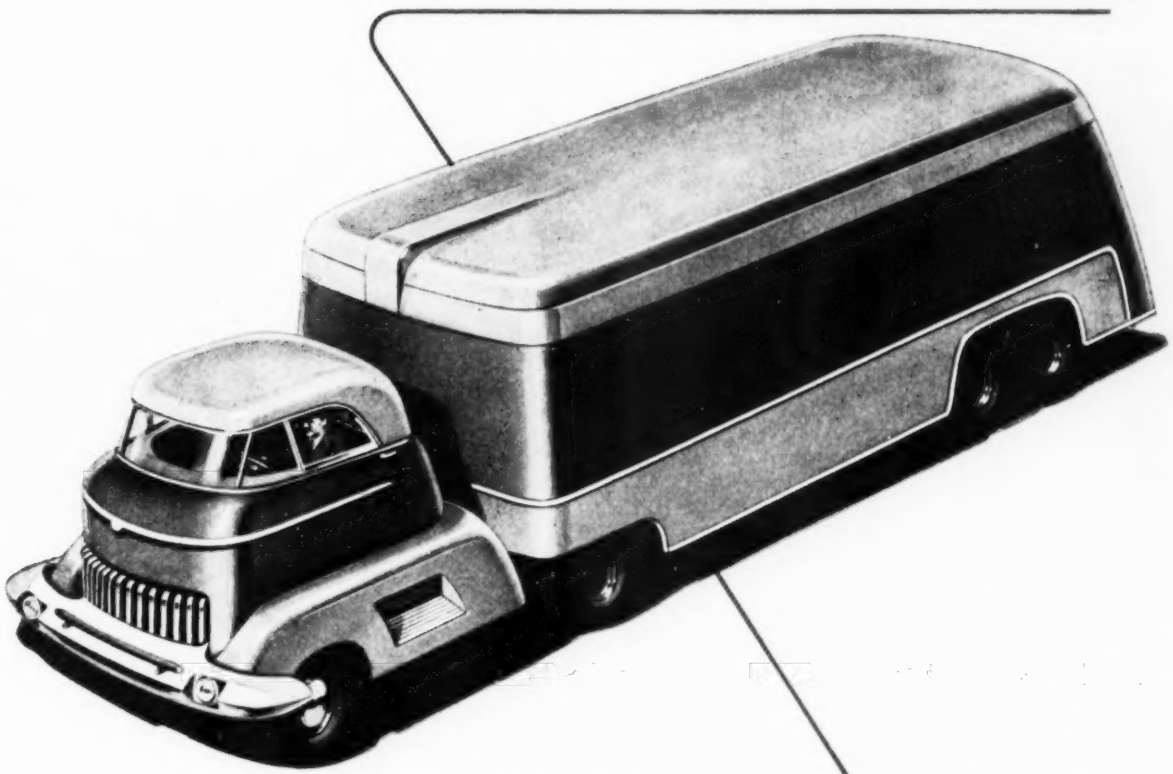
PROCESS CONTROL
—through Methods by Magnaflux
FINDS THE "HOW AND WHERE" of *LOWER PRODUCTION COSTS*
Write for this broad coverage booklet now.
***Registered trade mark**

MAGNAFLUX*

DETECTS DEFECTS

MAGNAFLUX CORPORATION
7304 W. Lawrence Avenue, Chicago 31, Illinois
New York 36 • Pittsburgh 36 • Cleveland 15
Detroit 11 • Dallas 9 • Los Angeles 58

Specify N·A·X HIGH-TENSILE STEEL for Lighter Weight, Longer Life and Operating Economy



N-A-X HIGH-TENSILE, having 50% greater strength than mild carbon steel, permits the use of thinner sections—resulting in lighter weight of products. It is a low-alloy steel—possessing much greater resistance to corrosion than mild carbon steel with either painted or unpainted surfaces. Combined with this characteristic, it has high fatigue and toughness values at normal and sub-zero temperatures, and the abrasion resistance of a medium high carbon steel—resulting in longer life of products.

N-A-X HIGH-TENSILE, with its higher physical properties, can be readily formed into the most difficult stamped shapes, and its response to welding, by any method, is excellent. Due to its inherently fine grain and higher hardness, it can be ground and polished to a high degree of lustre at lower cost than can mild carbon steel.

Savings in vehicle weight, with no loss in structural strength, increase the payload ratio and give greater operating economy when you make it a point to specify N-A-X HIGH-TENSILE steel for your highway equipment.

KEEP YOUR SCRAP MOVING TO YOUR DEALER

MAKE A TON OF SHEET STEEL GO FARTHER Specify— N·A·X HIGH-TENSILE STEEL ... And "MAKE YOUR PRODUCT LAST LONGER"

GREAT LAKES STEEL CORPORATION

N-A-X Alloy Division · Ecorse, Detroit 29, Michigan

NATIONAL STEEL CORPORATION

Industry News

(*Continued from page* 82)

Testing Laboratory Opens in Detroit

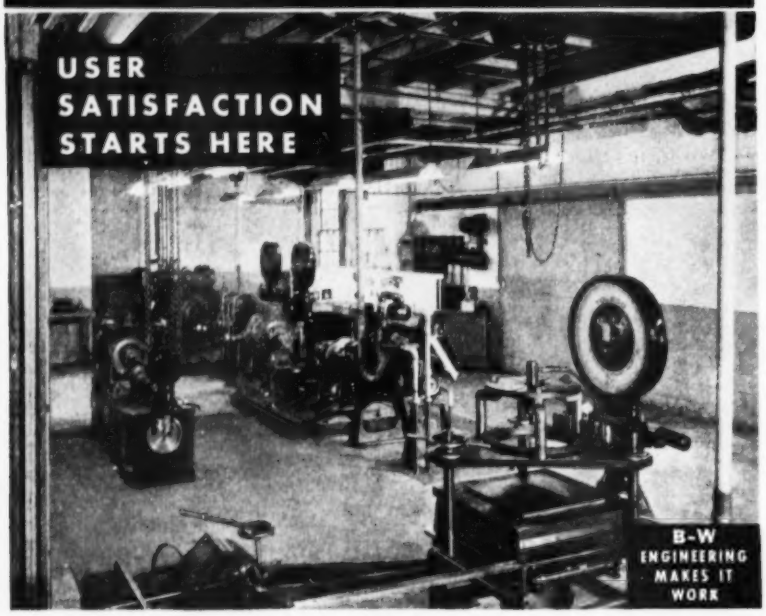
Recently announced is the formation of Weber Instrument Corp. Testing Laboratory in Detroit. Equipment for complete physical testing is available, and services include not only strain gage and stresscoat work, but also vibratory fatigue testing and dynamometer testing.

Y & T Sells Stock to Acquire Powdered

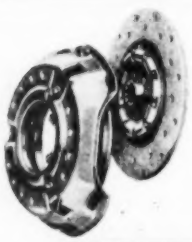
Yale & Towne Manufacturing Co. has made application for listing on the New York Stock Exchange of 12,000 additional shares of capital stock with a par value of $25 per share in connection with the acquisition of substantially all of the business and assets and the assumption of certain liabilities of Powdered Metal Products Corp. of America. Yale & Towne and Powdered entered into an agreement last month for the former to take this step.

The agreement also provides that, upon consummation of the transaction, the 12,000 shares of Y & T capital stock will be distributed by Powdered to its sole stockholder and Powdered will be dissolved. The transaction is expected to be closed prior to August 1, unless the closing is adjourned by either party to not later than September 1, or such later date as may be agreed upon. Powdered is engaged in the manufacture and sale of powdered or sintered metal products.

ROCKFORD CLUTCHES



Every type and size ROCKFORD CLUTCH must pass torque, strength, pressure, spin, heat, balance, wear, deflection, friction, run-out, flatness and endurance tests before being put into production. These torture tests are made on specially designed, accurate, clutch-checking machines. Let our engineers give *your* products the benefit of ROCKFORD test-proved CLUTCH reliability.



B-W
PRODUCTION
MAKES IT
AVAILABLE

ROCKFORD CLUTCH DIVISION BORG-WARNER
315 Catherine Street, Rockford, Illinois, U.S.A.

Expanding for Controls

Marking the company's third expansion in the past year, General Controls Co., Burbank, Calif., announces plans for a new 120,000 sq ft manufacturing plant, designed to augment production of the company's Grayson-Greenamyer Appliance Controls Div.

This latest expansion, following construction of a new midwest plant in Skokie, Ill., last fall and a substantial addition to the company's aircraft division in Glendale earlier this year, is intended to give General Controls additional production capacity for appliance controls. It will free areas in the Glendale plant for increased production of other automatic controls used for domestic and commercial applications.

Two Mills Announce Steel Body Sheets

For the first time in its history the Steel Company of Canada Ltd. is turning out steel sheets for bodies of 1953 automobiles. Cold rolled sheets for fenders, hoods and trunk lids, formerly imported as finished stampings, are now turned out at the cold reduction mill of Hamilton Works.

Pittsburgh Steel Co. recently announced its first shipments of steel sheets from its new hot rolled sheet mill at Allenport, Pa., are en route to the Chrysler and Packard automobile companies. The sheets are top quality hot rolled pickled and oiled in coils 56 in. in diameter. Each package contains three coils, or enough steel for about 27 automobile bodies.

Shipment of these coils signals completion of test runs on the new 66-in. semi-continuous hot sheet mill. The mill is now entering its break-in period before starting large-scale commercial production.

(*Turn to page* 174, *please*)

Specific steels

YOUNGSTOWN
Cold Finished
CARBON AND ALLOY STEEL BARS
Uniformly satisfactory in service because—
Machinability is outstanding
Tolerances are uniformly close
Metallurgical characteristics are rigidly controlled

QUALITY V YOUNGSTOWN SERVICE

FOR TOP QUALITY BARS

●ALL steel for Youngstown Cold Finished Bars is of predetermined analysis—produced in the open hearth by closely controlled blending and refining of raw materials. Rigid control from ore to finished product results in uniform dependability.

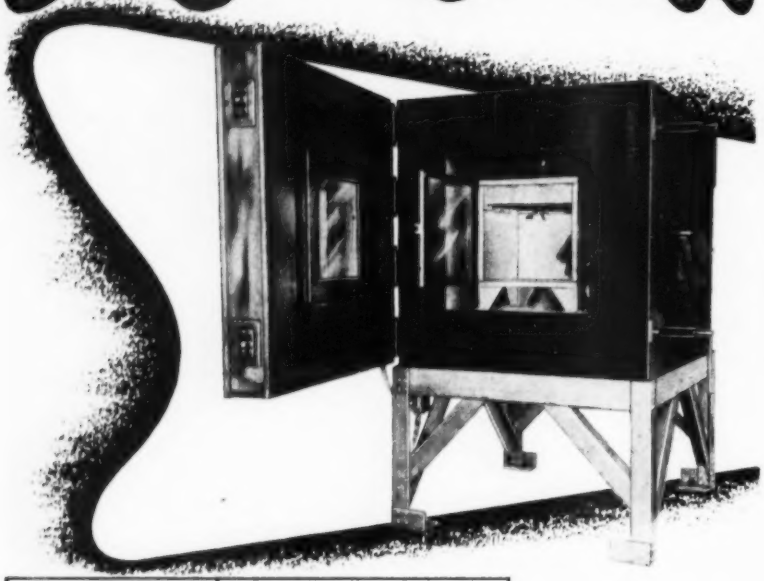
Youngstown Cold Finished Carbon and Alloy Steel Bars are furnished in standard shapes and sizes, in either coils or straight lengths. For further information, phone or write our nearest District Sales Office.

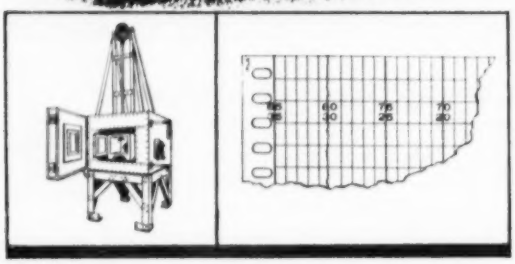
Youngstown COLD FINISHED CARBON AND ALLOY STEEL BARS

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*
General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.
PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES

another **BOWSER** *first*

THE NON-MAGNETIC CHAMBER





The unit produces any temperature from —112° F to 68° F . . . and HOLDS it . . . with temperature control of ± 0.1° F.

Stray magnetic fields can be a big headache in the development testing of pure metals. But not in this new chamber engineered by Bowser.

Used in determining effects of temperature on electrical fields, this Bowser non-magnetic chamber does not contain an ounce of steel that could hamper testing. It is constructed entirely of brass, copper, aluminum, rubber, bakelite, glass, wood and Fiberglas. All motors and electrical components are located over 6 feet away to eliminate effects of their electrical fields.

A special inner chamber thermally governed by vernier control is a double guarantee of testing accuracy.

For all your needs in environmental test equipment, be sure to check with Bowser — the pioneer. A field engineer will be glad to discuss your needs (at no obligation).

BTR

BOWSER TECHNICAL REFRIGERATION

DIVISION BOWSER, INC. TERRYVILLE CONNECTICUT

Industry News

(*Continued from page* 172)

GE Finds Cheaper Way to Test Jet Engines

According to reports, a new method for testing General Electric J-47 jet engines will result in annual savings to the American taxpayer of approximately $2 million.

The new method of testing calls for completion of the final acceptance test in one-third the time previously required. It is claimed that this step has been accomplished without reductions in the safety factor or quality of engines.

Developed by GE engineers, the plan has been put into operation at GE's Evendale, O., and Lynn, Mass., jet engine plants; at the Packard Motor Car Co. in Detroit and Studebaker Corp. at South Bend, Ind., where J-47 jet engines are also produced.

Adaptable Plant

Fluctuating freight rates giving advantage sometimes to the railroads and sometimes to trucks, are taken into account in the planned addition of 64,000 sq ft for materials handling and processing at the Chevrolet Commercial Body Plant in Indianapolis, largest in the world, T. H. Keating, general manager of the Chevrolet Motor Div., announced. The addition will be started this summer and is scheduled for completion in 1954.

Whereas steel supplies moving into the plant when it was built in 1936 were carried 75 per cent by rail and 25 per cent by truck, the new facilities will provide for 75 per cent truck shipments at present and infinite variations that may develop due to any possible future changes in freight rates.

Mallory Establishes Two Branch Offices

P. R. Mallory & Co. Inc. recently established two new branch offices in Dayton, O., and Milwaukee, Wis. Establishment of the new branches will facilitate service to customers in those areas previously served from the Indianapolis and Chicago offices, respectively.

New Milne Building

A. Milne & Co., has broken ground for a new building which will provide expanded facilities for its Chicago sales office and warehouse.

(*Turn to page* 178, *please*)

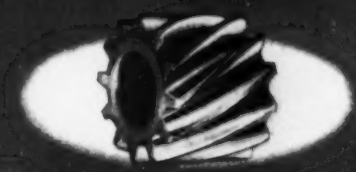
GEARS SHAVED in 12 to 20 SECONDS

Finishing precision gears to close tolerances on tooth profile, index, eccentricity and tooth surface smoothness on Red Ring Shaving Machines is a high production operation as indicated by these random examples.

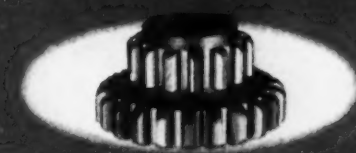
A SHAVING TIME 16 SECONDS

B SHAVING TIME 16 SECONDS

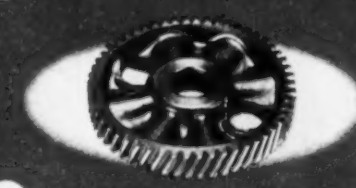
C SHAVING TIME 20 SECONDS



D SHAVING TIME 12 SECONDS



E SHAVING TIME 15 SECONDS

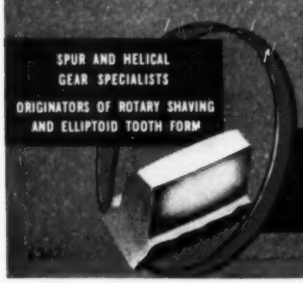


F SHAVING TIME 20 SECONDS

GEAR CHARACTERISTICS

Gear	Stock Removed Over Pins	Material	No. of Teeth	PD	DP	Face Width
A	.010"	Steel	19	2.4"	9.25	⅛"
B	.010"	Steel	29	4.00	9.25	11/16"
C	.010"	Cast Iron	28	2¾"	10	1⅛"
D	.005"	Steel	12	1⅛"	13.5	1"
E	.006"	Steel	14	2¼"	6/8	11/16"
F	.012"	Aluminum	54	5⅛"	10	⅜"

WRITE FOR DESCRIPTIVE LITERATURE ON *Red Ring Gear Shaving*



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

give the GO -signal to DETREX.....

for guaranteed metal cleaning performance

When you give the go-signal to Detrex, an experienced, well-coordinated team goes into high gear. A field service man talks with your engineers and production men to determine production, the operation following cleaning, and all the other factors that must be considered. Chemists and technicians in Detrex laboratories analyze the type of soil and determine the chemical process to remove it most effectively. Detrex engineers coordinate efforts with the laboratories to determine the type of equipment best suited to meet your production conditions. The result is a completely integrated process. A process providing all-round economy and efficiency that is only possible through such coordinated planning. A process that is *completely guaranteed* by one responsible company . . . Detrex.

There is another important benefit, too. The Detrex team is not confined to one type of cleaning process in its recommendation. That's because Detrex—and only Detrex—produces both the equipment and chemicals for all . . . solvent degreasing, alkali and emulsion washing, and phosphate coating processes for rust prevention and better paint adhesion.

This combination of coordinated planning and flexibility of cleaning method is unique with Detrex. It consistently pays off in maximum cleaning efficiency at lowest operating costs. We guarantee it!

for free survey

At no obligation to you, the Detrex field service man in your area will come in and survey your present operations or discuss proposed ones. There is no cost for the service. The result will prove to you the money-saving advantage of Detrex service. Just fill out and mail the coupon below . . . our field man will contact you for the most convenient time to come in.

DETREX CORPORATION,
DEPT. 204, BOX 501,
DETROIT 32, MICHIGAN

Please have the Detrex man in our area make an appointment to survey our operations to point up ways of cutting cleaning costs.

NAME .....
COMPANY .....
ADDRESS .....
CITY..... **ZONE**.....**STATE** .....

DETREX CORPORATION

DEGREASERS • DEGREASING SOLVENTS • WASHERS
ALKALI & EMULSION CLEANERS • DRYCLEANING
EQUIPMENT • PHOSPHATE COATING PROCESSES

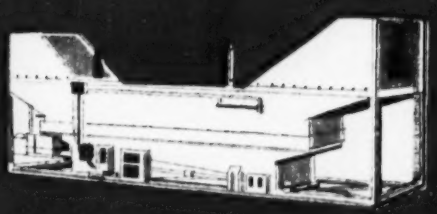
DETREX
ONE-STOP
SERVICE

industry's most comprehensive metal cleaning service

chemicals

Only Detrex produces alkalies, emulsions, phosphate coatings and degreasing solvent. Perm-A-Clor, the premium-grade Detrex solvent, is produced in our plants at Ashtabula, Ohio and Tacoma, Washington. Other chemicals are produced in our Detroit Hillview plant. In both cases modern facilities are used for finest product quality and latest techniques safeguard consistent chemical analysis. Regardless of the type equipment you are now using it will pay you to investigate the advantage of using Detrex chemicals.

equipment



field service

research

The Detrex research center contains extensive laboratory facilities manned by people eminently qualified through training and experience. Their work falls into two general classifications. The first is to develop new chemicals and processes to keep pace with the ever changing needs of industry. The second is the constant search for ways to make present Detrex products work more effectively for our customers. These facilities and skills are always at your disposal as another part of Detrex-One-Stop Service.

Industry News

(*Continued from page* 174)

Simmonds to Produce British Rescue Set

Simmonds Aerocessories, Inc., recently announced that it has secured exclusive U. S. rights to the manufacture and sale of Sarah search and rescue and homing equipment. This is the new miniature radio-radar beacon and homing equipment which the Royal Air Force has recently adopted as standard equipment for finding lost pilots.

The designer and manufacturer of the equipment in England is Ultra Electric, Ltd. Grumman Aircraft has contracted to purchase the first sets of the equipment available in the U. S.

AMI to Move Plant to Elizabeth, N. J.

Automatic Methods, Inc., manufacturers of precision parts for aircraft and lead screw tapping attachments, recently completed arrangements for moving its operations to Elizabeth, N. J. The new plant will combine all operations of three plants operating in Newark into one larger plant with approximately 17,000 sq ft of floor space.

Clad Metal Plant Set to Operate

A new clad metal plant, which will produce gilding metal clad steel strip for bullet jackets for the Army, is ready for full-scale operation by Superior Steel Corp. The plant will increase the company's clad metal capacity from 30,000 tons to approximately 80,000 tons per year.

Built and equipped jointly by Superior and the Ordnance Corps at a cost of $7,757,865, the plant will operate under new methods and processes which are expected to save the Government between $100 and $150 a ton. It is claimed that the basic clad metal process has saved 80 per cent of copper and zinc in each bullet jacket.

Superior Coach Starts Western Div. Plant

Ground-breaking ceremonies in Oakland, Calif., recently opened way for construction of a Western Div. of Superior Coach Corp. The Oakland plant will be the major parts and service depot for Superior coaches on the West Coast and in the western states.

Fairchild Stratos Div. Receives New Orders

New orders for aircraft accessories totaling over $11.5 million have been received by the Stratos Div. of Fairchild Engine and Airplane Corp. The orders are primarily for equipment for installation in jet combat aircraft.

Included are contracts for several models of air-turbine drives, a number of different air-cycle refrigeration packages for jet fighters and bombers, and sizable quantities of mass-flow, temperature control valves.

The new orders are said to bring the backlog to the highest total in the division's history.

Grumman Elected Recently to AIA

The election of Grumman Aircraft Engineering Corp. to membership in the Aircraft Industries Association has been announced. The company has been for many years a major Navy aircraft contractor.

(*Turn to page* 180, *please*)

Eclipse-Pioneer* triples balancing output of air-pump rotors with TREBEL BALANCER

Rough balancing increased from 3.1 to 9.6 per hour
Fine balancing increased from 3.15 to 13.1 per hour

*Division of Bendix Aviation Corporation

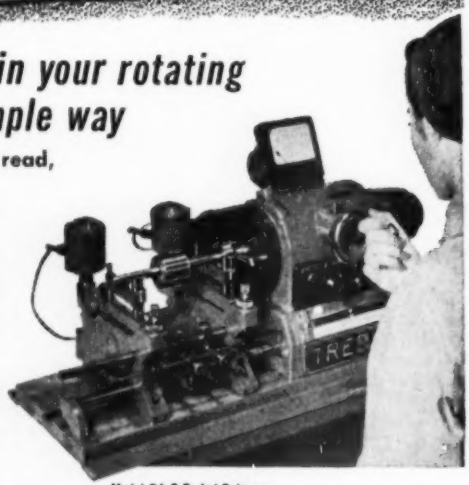
Locate unbalance in your rotating parts this fast, simple way

Takes less than a minute to read, 2 minutes to set up.

No special skills are needed to detect the *unbalance* that causes *vibration* in rotating parts . . . when you use the TREBEL DYNAMIC BALANCER.

The unique TREBEL dynamic balancing principle applies a variable counter-vibration to counteract unbalance vibration. Direct readings in ounce-inches give the *amount* of unbalance without further calibration; readings in degrees show *location* of unbalance.

That's why so many leading plants use the TREBEL.



Model 2b5 Trebel Balancer
Weight capacity 2½ oz. to 4½ lbs.
Max. work diameter 7"; length 18"
Accurate within .000025" displacement of center of gravity
Other Trebel models for work up to 22,000 lbs. and 98½" OD.

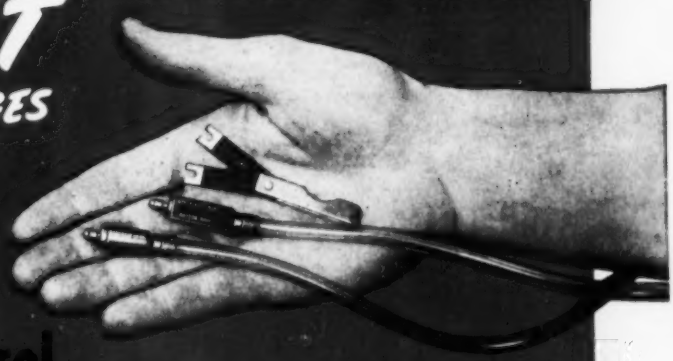
Write for Catalog "B" or see a demonstration in your own plant.

KO KURT ORBAN COMPANY, INC.

205 East 42nd St., N. Y. 17 • Offices in Cleveland, Detroit, Los Angeles, San Francisco, Houston
Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Canada.

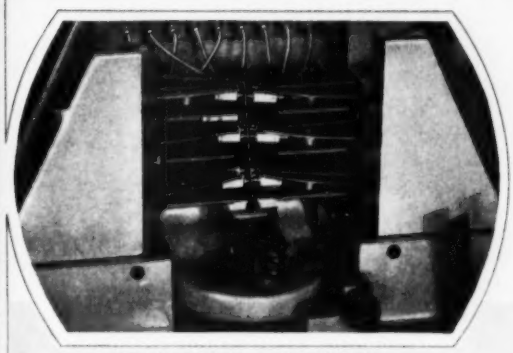
PLUNJET
GAGING CARTRIDGES

WIDELY USED For Inspection and Machine Control



The Plunjet is made with both rectangular and cylindrical short and long housings.

Plunjets with Precisionaire for checking jet engine blades.



Jet blade fixture using Plunjets.

PLUNJET GAGING CARTRIDGES... the self-contained gaging heads you can use practically everywhere, were developed by Sheffield in 1949.

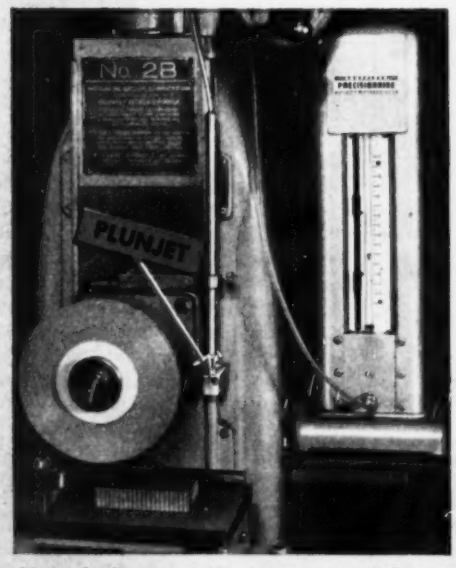
THOUSANDS ARE NOW IN USE on a wide variety of gaging fixtures and machine control applications.

MORE THAN FIVE THOUSAND are used on gages for checking jet engine blades.

PLUNJET GAGING CARTRIDGES ARE STANDARD LOW-COST STOCK ITEMS which can be applied by users to practically any gaging fixture or machine tool control where indication is required.

***WRITE FOR ENGINEERING DATA** giving ranges, amplifications, applications, mounting dimensions and prices.*

IMMEDIATE DELIVERY FROM STOCK



Plunjet feed gage enables operator to grind to a degree of accuracy previously impossible.

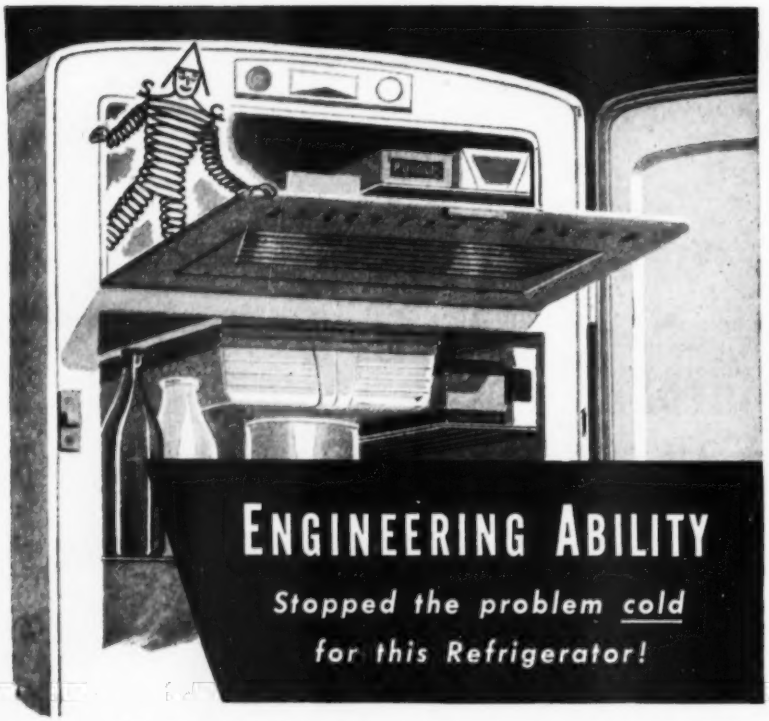
6302

SHEFFIELD HEADQUARTERS

the **Sheffield** corporation

DAYTON 1, OHIO, U.S.A.

GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTRACT SERVICE



. . . with Springs by Automatic Spring Coiling Co.

The need was very specific—

"Give us a spring," this refrigerator manufacturer requested, "that can THINK . . . so to speak. We have an evaporator door to the cold chest compartment that must respond to the touch of a finger, swing open to a certain angle, and stop there. It should also be possible to close the door with a nudge of a food-burdened housewife's elbow."

So . . . Automatic Spring Coiling Co. was called in and *Engineering Ability* came through!

The answer . . . calculated by our engineers . . was to design a spring with precisely the right *build-up*, with just the right combination of spring and wire diameter. In this way, not only would the spring do the required job—metering out its energy at the right rate—but also tolerances would be such that production could be handled with facility on our high speed equipment.

Put Automatic Spring Coiling Co. to work on *your* spring problem. See how members of our entire organization—consultants, designers, sample-makers, inspectors—swing into operation and *click*. Working as a well-integrated team with strict adherence to Quality Control we pledge ourselves to bring you the finest, most dependable springs to insure the successful and efficient performance of your product.

Our veteran consulting engineers are ready to survey your requirements without obligation. Please write.

AUTOMATIC SPRING COILING CO.
4048 West Thorndale Avenue
CHICAGO 30, ILLINOIS

Industry News

(*Continued from page* 178)

Welding Process Value Proven at Motor Wheel

Production at Motor Wheel Corp. of wheels for automobiles and agricultural and industrial vehicles by a new welding process called Electrofuse has passed the five million mark without record of a single wheel failure.

The process is not a spot-welding one. It is an electronically controlled three-phase resistor method of welding in which wheel discs are fused to wheel rims, forming an integral assembly.

Ordnance Plans to Buy Ammunition Tooling

The Government is planning to buy about $12 million worth of machine tools to be used by contractors producing ammunition, according to the Ordnance Corps. Contractors will place the order after they are approved by Ordnance, and the Government will bear the cost. The new orders are in addition to about $30 million worth of tools already ordered.

Clark Revamps Dealer Set-Up

Clark Equipment Co. has revamped and expanded its dealer organization in the Mid-West and on the West Coast to handle its newly-acquired Ross straddle trucks and fork-truck lines. Clark acquired The Ross Carrier Co. earlier this year.

Brake Fluids Tested

Higher engine horsepowers in passenger cars which lead to higher cruising speeds have spotlighted the problem of sub-standard brake fluids. Chrysler says, that of 22 commercial brands tested, five are below minimum requirements for safe operation. Principal problem is that the boiling point falls below the 230F specified by SAE as safe for moderate duty.

Chrysler engineers say that several brake-downs from 70 mph to 50 mph raises temperatures in wheel cylinders 130F to 140F above surrounding atmosphere, enough to cause vapor lock or boiling with inferior fluids. Minnesota already has a law banning sale of brake fluid which does not bear the approval of the Commissioner of Highways.

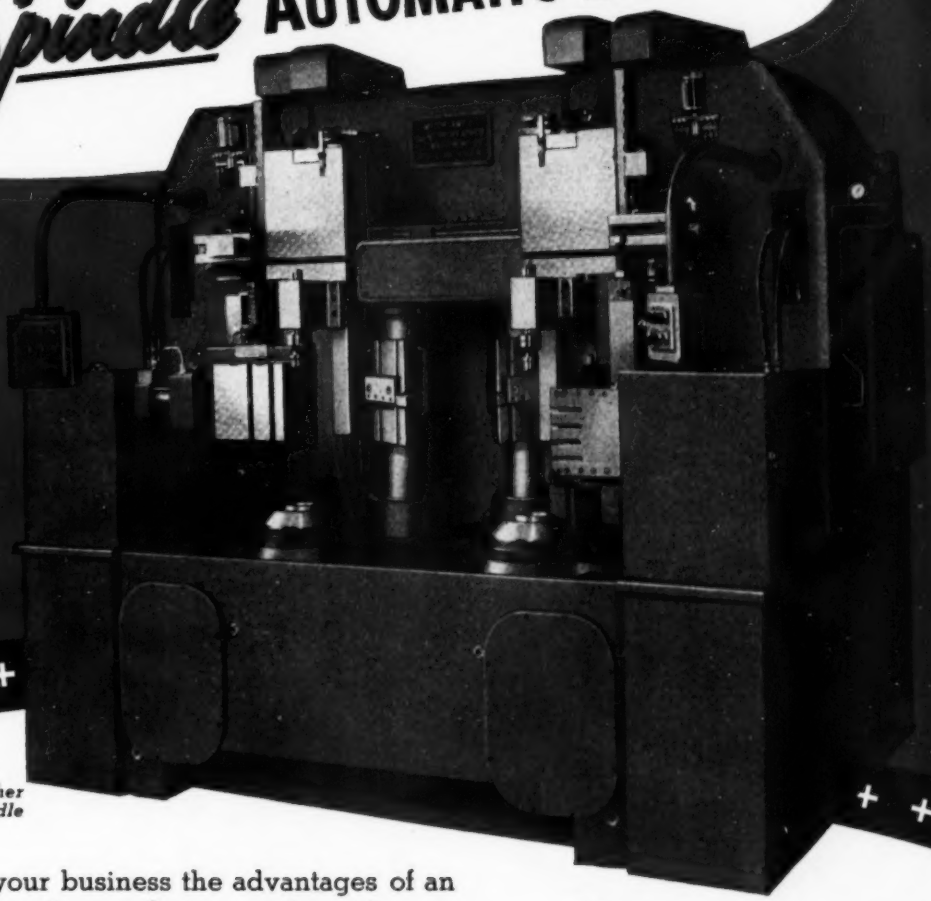
(*Turn to page* 184, *please*)

Obtain *PLUS* Values from the Motch & Merryweather *Twin-Spindle* Automatic Lathe...

GET PLUS PRODUCTION!

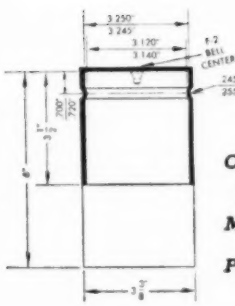
GET PLUS ACCURACY!

GET PLUS PROFITS!



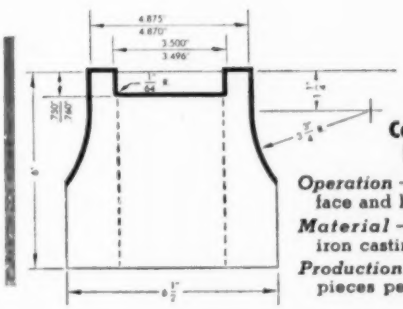
Motch & Merryweather VTBF-12 Twin Spindle Automatic Lathe.

Command for your business the advantages of an automatic turning-boring-facing cycle with precision – *plus* the value of *twin yet independent* spindles – *plus* the value of vertical facility for handling parts. These machines are accurate, rugged, and dependable, yet simple to set up.



Case Study No. 96

Operation – Turn, face, groove and center drill.
Material – SAE 1335 annealed.
Production – 124 pieces per hour.



Case Study No. 124

Operation – Turn, face and bore.
Material – Gray iron casting.
Production – 60 pieces per hour.

STANDARD SPECIFICATIONS

Chuck diameter	10"
Swing	12" dia.
Work height: chucking	12"
between centers	16"
Turning slide, vertical feed	14"
Boring slide, vertical feed	14"
Facing slide, horizontal swing	6"

★ ★ ★

Individual, selective hydraulic feed for each slide. . . . Special variations to meet individual requirements. . . . Simple contours by cam-operated tools. . . . Tracer control can be added.

Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

TOPS IN QUALITY...

The NEW "J&L COLD FINISHED

UNSURPASSED AMONG FREE-MACHINING STEELS

"J&L 1200" Steel, most recent of the corporation's many Cold Finished firsts has already proved itself in Screw Machine Shops throughout the industry. More and more evidence of the outstanding performance of this new free-machining steel is constantly being furnished by reports from the growing number of machine shops who regularly specify "J&L 1200" Cold Finished Steel for their production runs.

"J&L's 1200" series meets equivalent compositions published by the American Iron & Steel Institute, the Society of Automotive Engineers, and Federal Specifications QQS-663.

STANDARD IN PRICE

"1200"

CARBON STEEL

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Please forward a copy of your booklet, "J&L 1200" Cold Finished Steel.

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COMPANY _____

ADDRESS _____

Industry News

(*Continued from page* 180)

Illinois Tech to Open Equipment Center Soon

A national center to conduct education and research in the methods of industrial equipment acquisition and replacement will be established this fall in the department of business and economics at Illinois Institute of Technology.

The center, to be known as the National Center of Education and Research in Dynamic Equipment Policy, will be housed on the Institute's Chicago campus. The Machinery and Allied Products Institute will finance it during its initial years.

The center will have two basic objectives: the wide dissemination of information as to enlightened equipment policy; and sustained study of improved techniques and continued analysis of the problems and practices of business in this field.

Sleep Over Cab

An innovation in the line of White-Freightliner highway trucks is a new type cab with sleeping compartment over the driver instead of behind the driver. This new sleeper cab has been adapted to the WF-64 dual drive truck chassis.

The new cab arrangement gives 23 ft of loading space on the truck with a total of 51 ft with full trailer, within a 60-ft overall length.

Mansfield Tire Co. Builds New Plant

Mansfield Tire and Rubber Co. has started construction of a new modern tire manufacturing plant to cost more than $1 million. It will add an additional 52,000 sq ft of floor space and will have a capacity of 6000 tires a day.

McAleer Changes Name to Goodison Mfg. Co.

McAleer Manufacturing Co. of Rochester, Mich., has changed its corporate name to Goodison Manufacturing Co., Inc. The new company will confine its activities exclusively to producing industrial buffing and polishing compounds which will carry the Goodison name. Previously, the company also produced polishes and maintenance and refinishing materials.

Auto-Lite Undergoes Expansion Program

A total of 380,220 sq ft of manufacturing space will be added to the facilities of The Electric Auto-Lite Co. during 1953.

Largest of the expansion underway is the construction of a new 225,000 sq ft building adjacent to the Stickney Avenue plant of Auto-Lite in Toledo, O. The building will be utilized primarily for the manufacture of products vital to defense.

Two battery plants are being expanded to meet the ever growing demand for replacement batteries. Expansion of the plant at Niagara Falls will total 41,930 sq ft, while the battery plant in East Point, Ga., will be increased by 7290 sq ft.

A total of 50,000 sq ft is now being added to the spark plug plant in Fostoria, O. The bumper plant at Sharonville, O., will be expanded by an additional 56,000 sq ft.

DeVilbiss Expands Metal Working Div.

Expansion of the Metal Working Division of the DeVilbiss Co. has been announced. To handle the company's expanding business in the spray booth field, an addition is being built on to the present building occupied by the sheet metal division.

● In Flexon Thermostats the engine manufacturer gets a combination that is vital to his operation—a quality product backed by a reputable manufacturer with over 50 years manufacturing experience. Since 1902, Flexonics Corporation has specialized in the manufacture of products that utilize flexible metal elements. Since 1937, Flexonics Corporation has manufactured quality bellows. All the know-how accumulated over these years goes into every Flexon Thermostat. All the experience in meeting customers' specifications and production schedules has developed a policy of complete cooperation to help keep your output flowing smoothly.

We would like to have the opportunity to go over your needs with you and show you what Flexonics Corporation can do for you. Write, wire or phone to have your Flexonics sales engineer call.

Flexonics *Corporation* 1396 S. THIRD AVENUE · MAYWOOD, ILLINOIS

FLEXON BELLOWS DIVISION

FORMERLY CHICAGO METAL HOSE CORPORATION

Flexon identifies CMH products that have served industry for over 50 years.

Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Announcing a new gage that simplifies the measurement of

SURFACE ROUGHNESS

...the

BRUSH SURFINDICATOR*

Manufactured under patent license from General Motors Corporation

BRUSH ELECTRONICS COMPANY

INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT
ULTRASONIC EQUIPMENT

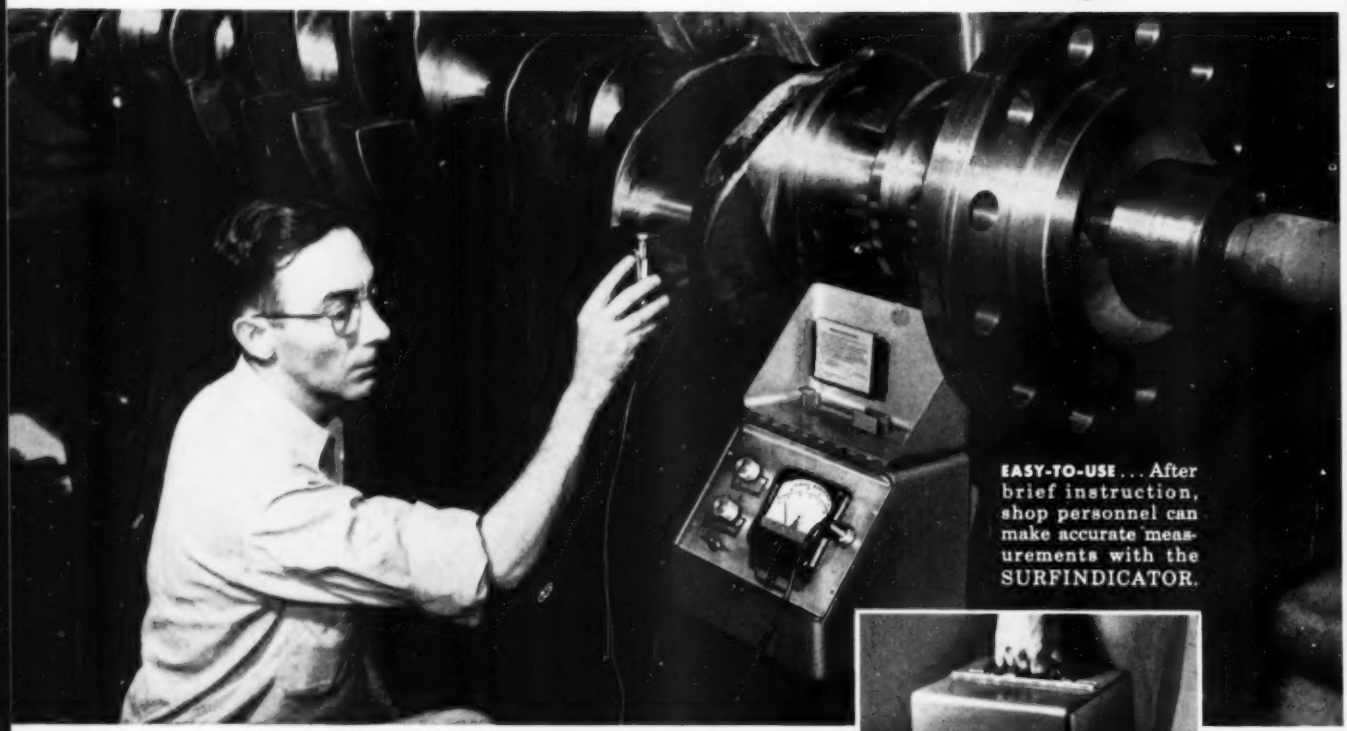
BRUSH ELECTRONICS

formerly
The Brush Development Co.
Brush Electronics Company
is an operating unit of
Clevite Corporation.

*Trade Mark

Here is a practical shop tool for measuring

SURFACE ROUGHNESS

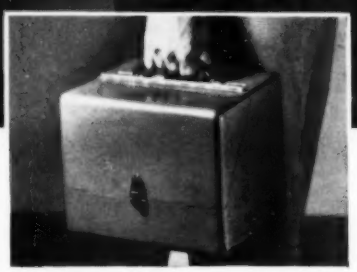


EASY-TO-USE... After brief instruction, shop personnel can make accurate measurements with the SURFINDICATOR.

...the BRUSH SURFINDICATOR*

With this new, portable inspection tool you can make surface roughness measurements on the production line. The operator merely guides the pickup over the piece to be inspected, and then reads surface roughness in average microinches on the meter. This permits you to specify surface roughness in the design and then to measure it in the shop.

The SURFINDICATOR is always reliable because the unit is equipped with Precision Reference Specimens. These permit checking accuracy of the instrument at any time, and provide a set of standards for absolute calibration. Using SURFINDICATORS, several plants in different locations can produce parts to the same surface roughness specifications. Here is the instrument that makes surface roughness measurement a practical shop operation. Get the complete story on the BRUSH SURFINDICATOR now!



PORTABLE...Weighs only 15 pounds and can be set up anywhere in the plant where 115 volts a.c. is available. Completely self-contained.

ACCURATE . . . Precision Reference Specimens permit calibration to an absolute standard, and enable you to check accuracy of instrument at any time.

MAIL COUPON FOR BULLETIN — OR ASK YOUR BRUSH REPRESENTATIVE FOR DEMONSTRATION!

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   M. S. Caldwell, 289 Fairfield Ave.
2. **NEW YORK 13, New York**
   Burlingame Associates, 103 Lafayette St.
   Offices: Asbury Park, N. J., Bogota, N. J., Philadelphia, Pa., Syracuse, N. Y., Upper Darby, Pa.
3. **CLEVELAND 15, Ohio**
   M. P. Odell Co., 2536 Euclid Ave.
4. **WASHINGTON 9, D. C.**
   Brush Electronics Co., 1609 Connecticut Ave., N.W.
5. **DETROIT 14, Michigan**
   Anthony R. Satullo, 7635 E. Jefferson Ave.
6. **INDIANAPOLIS 20, Indiana**
   Armin Leich, 5860 Norwaldo Ave.
7. **ALEXANDRIA, Virginia**
   W. A. Brown & Associates, 3834 Mt. Vernon Ave.
   Offices: Atlanta, Ga., Birmingham, Ala., Charlotte, N. C., Tampa, Fla.
8. **CHICAGO 45, Illinois**
   Hugh Marsland & Co., 6405 N. California Ave.
9. **MINNEAPOLIS 4, Minnesota**
   H. M. Richardson & Co., 9 East 22nd Street
10. **KANSAS CITY, Missouri**
    Everett Associates, 1629 East 31st Street
11. **DALLAS 1, Texas**
    J. Y. Schoonmaker Co., 2011 Cedar Springs Ave.
12. **PORTLAND 16, Oregon**
    James L. Kearns, P. O. Box 5108
13. **HOLLYWOOD 28, California**
    Gerald B. Miller Co., 1550 N. Highland Ave.
    Offices: Albuquerque, N. M., San Francisco, Calif.
14. **BRUSH ELECTRONICS CO.,**
    Cleveland 14, Ohio

*Trade Mark

Brush Electronics Company, Dept. DD-6
3405 Perkins Avenue, Cleveland 14, Ohio

Please send bulletin on the SURFINDICATOR

Your name .....

Company .....

Position .....

Address .....

City ..... State .....

MEN *in the* NEWS

(*Continued from page* 25)

Westinghouse Electric Corp.—**D. E. Inman** has been appointed engineering manager of general industrial products.

New York Air Brake Co.—**Lowell R. Burch** has resigned as board chairman but continues as chairman of the executive committee and as a director. **Lewis K. Sillcox** was elected honorary vice-chairman. **Charles T. Zaoral** was elected to the executive committee.

Marmon-Herrington Co.—**Robert C. Thurman** is now northeastern district manager.

Reliance Electric & Engineering Co.—**Hugh D. Luke** has joined the firm to head the newly created central product planning department within the manufacturing department at Cleveland for two plants there as well as for plants at Ashtabula and Euclid. **James A. Brandt** is assistant manager. At the Ashtabula plant, **A. S. Tustin** was promoted to superintendent, **Robert B. Adams** is night superintendent, and **Henry C. Dettenmayer** is production manager.

Feedall Machine & Engineering Co.—**Richard H. Crotty** has been made chief engineer and **Claude C. Sowers** production manager.

Ahlberg Bearing Co.—**R. L. Schutte** has been made sales manager, **P. H. Staerk**, advertising manager, and **J. E. Davis**, assistant treasurer.

Sparton Automotive Div., Sparks-Withington Co.—**Cleafe A. Best, Jr.** has been designated chief development engineer.

Jack & Heintz, Inc.—**S. Floyd Stewart** has been appointed assistant to the president.

Aircraft Metal Forming Co.—**R. F. Baird** has been appointed vice-president and general manager, and **Seibly S. Buffum** has been appointed sales manager.

United States Spring & Bumper Co.—**Morris B. Pendleton** was elected a member of the board of directors.

Pacific Airmotive Corp.—**Arthur C. Stewart** has resigned as chairman of the board, and **Thomas Wolfe** has been elected to the chairmanship.

(*Turn to page* 188, *please*)

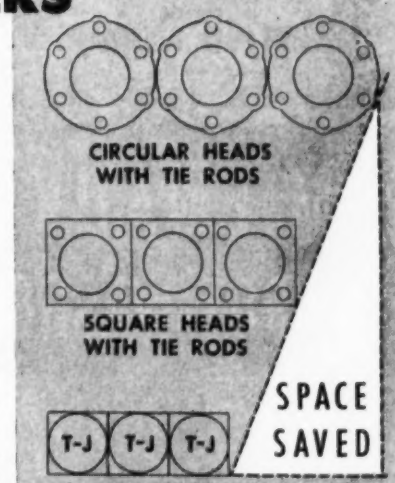
LESS SPACE!

extra high safety factor!

NEW T-J Spacemaker AIR CYLINDERS

These new T-J Cylinders *save up to 40% in mounting space*—with streamlined design that eliminates tie rods. They're *super rugged*—extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, hard chrome plated piston rod.

Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.



T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

37 YEARS EXPERIENCE

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FOR YOUR "AN" OR STANDARD

STAINLESS STEEL FASTENERS . . IT'S ALLMETAL

For quality and delivery

ALLMETAL, Specialists in Stainless, Produce Stainless Products Exclusively

Allmetal Stainless Fasteners meet the rigid specifications of the Aviation Industry. All types and sizes, "AN" or STANDARD, in stock. Stainless Phillips Recessed Head Screws and Specials available too. Complete facilities under one roof assures prompt delivery.

WRITE FOR CATALOG X

ALL MADE TO "AN" SPECS
• MACHINE SCREWS
• NUTS
• BOLTS
• PINS
• RIVETS
• WASHERS

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STAINLESS STEEL FASTENERS

ALLMETAL

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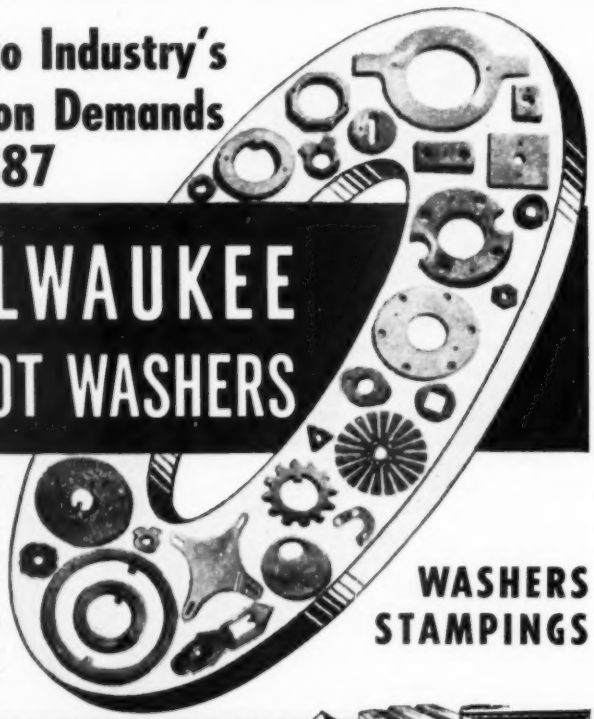
33 GREENE STREET NEW YORK 13, N. Y.

Geared to Industry's Production Demands Since 1887



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Offering the most complete line of washers available today . . . all types and sizes, all materials, all finishes. More than 25,000 sets of dies. Let us quote on your requirements.

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WROUGHT WASHER MANUFACTURING CO.

The World's Largest Producer of Washers

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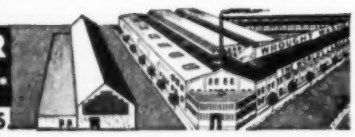

MEN *in the* NEWS

(*Continued from page* 187)

Mather Spring Co. — **Henry T. Mather** has been named president, **Gordon M. Mather,** chairman of the board, and **Philip Hendrickson,** administrative vice-president.

Standard Products Co.—**L. S. Larson** has been promoted to controller, and **Charles C. Hammer** has been made a director of financial planning.

General Electric Co., Chemical Div. —**Emmett E. Hinson, Jr.,** has been appointed manager of industrial laminates and insulating materials sales.

Sundberg-Ferar—**Howard F. Weber** has joined the firm's staff as a designer.

Consolidated Vultee Aircraft Corp. —**Frank Pace, Jr.,** and **Lawrence B. Richardson** have been elected vice chairmen of the board. **August C. Esenwein** has been elected a vice-president.

Kellett Aircraft Corp.—**Walter N. Connors** is now industrial relations administrator.

St. Paul Hydraulic Hoist—**Eugene J. Vineyard** has been appointed export manager.

Electric Auto-Lite Co., Spark Plug Div.—**Russell W. Higgins** has been named assistant sales manager.

Ford Div., Ford Motor Co.—**James O. Wright** has been named assistant general purchasing agent, while **W. A. Folsom** succeeds him as assistant general manufacturing manager.

Dow Chemical Co.—**Dr. John J. Grebe** has been named director of nuclear research and development.

Chrysler Div., Chrysler Corp. — **Marc R. Prass** is now director of service.

B. F. Goodrich Co.—**Arthur Kelly** has been named president of the new Tire and Equipment Div., and **Clyde O. DeLong** now heads the new Industrial Products Div. Named as vice-presidents of the former division are: **Joseph A. Hoban,** vice-president-replacement sales; **E. F. Tomlinson,** vice-president-equipment sales; and **J. E. Gulick,** vice-president-manufacturing. Vice-presidents of the latter division are: **Robert V. Yohe,** vice-president-sales, and **Rollin D. Hager,** vice-president-manufacturing.

(*Turn to page* 190, *please*)

FUNDAMENTAL FACTORS IN EQUIPMENT LEADERSHIP

TOP
Technical Talent

KNOW-HOW is a relatively new word that Webster defines as "technical expertness and accumulated practical skill in lining up a complicated operation for smooth, efficient execution."

Thus "know-how" is precisely the right word to describe one specialty that AC has to offer every user of automotive equipment. For nowhere in the industry is the ability to design and build new products more evidenced than it is at AC.

That's why 300 manufacturers now look to AC for specialized equipment that helps to improve the quality and salability of their products.

That's why you, too, can benefit by AC's 45 years of experience and vast facilities when seeking a reliable source for your equipment needs.

AC QUALITY PRODUCTS

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• ADAPTERS (Drive) • AIR CLEANERS • AIR CLEANERS AND SILENCERS (Combination) • AMMETERS • BREATHERS (Crankcase) • CAPS (Radiator Pressure) • FLEXIBLE SHAFT ASSEMBLIES • FUEL PUMPS • FUEL AND VACUUM PUMPS (Combination) • FUEL FILTERS & STRAINERS • GASOLINE STRAINERS • GAUGES—AIR (Pressure) • GAUGES—GASOLINE • GAUGES—OIL (Pressure) • GAUGES—TEMPERATURE (Water, Oil) • OIL FILTERS (Lube) • PANELS (Instrument) • SPARK PLUGS • SPEEDOMETERS • TACHOMETERS • TERMINALS (Ignition Wire) • VALVES (Crankcase Ventilation)

AC SPARK PLUG DIVISION GM GENERAL MOTORS CORPORATION

ACCO products CHECK

☐ Shaped Wire*

— Flat
● Round
⧓ Odd contour

Low or high carbon, stainless, special alloy, Armco. You draw the shape — PAGE can draw the wire.

☐ Armature Banding Wire

Tinned stainless or carbon steel. In reels of 50 to 200 pounds. Stainless has high tensile strength, high resistance, low permeability.

☐ Lock Safety Wire

Tough, durable, workable. In the size and type for your work.

☐ Spring Wire

Any shape* . . . high carbon . . hard drawn . . . high tensile . . . stainless . . . galvanized . . . tinned . . . bright.

*Cross-sectional areas up to .250" square; widths to ⅜"; width-to-thickness ratio not exceeding 6 to 1.

YOU do this—
Give us the specifications of the wire you need—or tell us details of job to be done.

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Send you recommendations, prices and delivery date. Samples on request. PAGE offers you a wide variety of wires to choose from.

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AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

MEN *in the* NEWS

(*Continued from page* 188)

Marmon-Herrington Co., Inc. — **Robert V. Cummins** has been chosen to head the sales promotion department.

Henney Motor Co.—**Paul C. Funkhouser** is now vice-president in charge of operations.

Clevite Corp.—**Vaughn D. Cahill** was named procedures director recently.

Stratos Div., Fairchild Engine & Airplane Corp.—**J. Warner Livingston** has been appointed assistant general manager.

Henney Motor Co., Inc.—**Harold J. Mink** is now cost analyst and executive assistant.

Asbestos Manufacturing Co.—**Carl P. Brockway** has been elected president and director.

Olin Industries, Inc.—**Gordon Grand, Jr.** is now assistant to the president.

Bohn Aluminum & Brass Corp.—**Clifford J. Alpaugh** has been named director of purchases.

Gunite Foundries Corp.—**F. W. Thayer** has become works manager in charge of foundry operations.

Continental-Diamond Fibre Co.—**Olan R. Thomas** is now advertising and sales promotion manager.

Mechanical Air Controls, Inc.—**Jack L. Modrich** has become general sales manager.

General Controls Co.—**Richard G. Ray** has been named vice-president in charge of manufacturing.

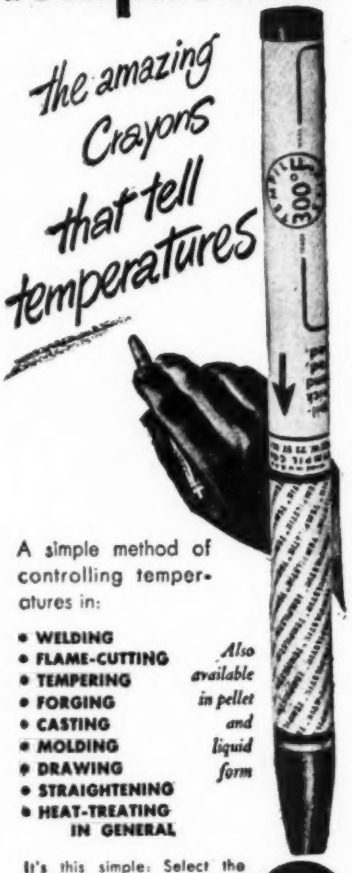
Clevite-Brush Development Co.—**Dr. Waldo H. Kliever** has joined the firm as vice-president and director of instrument development.

Classified Advertisement

WANTED—AUTOMOTIVE COPYWRITER. Opportunity for young man with successful automotive writing and sales promotion experience in growing fully recognized Ohio Agency with automotive, farm and general accounts. Write Box 71, stating experience and qualifications and send photograph.

Tempilstiks°

the amazing Crayons that tell temperatures



A simple method of controlling temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

Also available in pellet and liquid form

It's this simple: Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

$2 each — gives up to 2000 readings

Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

FREE —Tempil° "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

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Thermocouple Supplies • Industrial Furnaces & Ovens
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proved in automatic **transmissions**

MORAINE friction materials

OFFER IMPORTANT ADVANTAGES IN MANY APPLICATIONS

(Parts shown are typical)

Moraine friction materials established their reputation in automatic transmissions such as Powerglide, Dynaflow and Hydra-Matic. The success of Moraine friction materials for clutch plates and bands has encouraged their use for other and wider applications which have given better performance at lower cost to a variety of mechanisms. Special military equipment, household appliances, automatic transmissions for commercial trucks of every size, and military vehicles have benefited as a result of these developments. On the basis of our experience and ability, we may be able to help you improve *your* product.

moraine products

DIVISION OF GENERAL MOTORS CORPORATION, DAYTON, OHIO

. . or Released in an Instant

Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts *never* work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study *your* fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

Write
GREER STOP NUT CO.
2620 Flournoy, Chicago 12, Ill.

Automatic Transmissions; Power Steering

(*Continued from page* 46)

options, including overdrive in several combinations. The effect of this has been to reduce the number of conventional manual shift cars quite markedly, but also at the expense of some automatic drives.

In the case of Kaiser the sharp increase in automatic transmission use does not imply a larger volume of use as compared with last year. It is a result of reduced production, relatively, owing to supplier difficulties, coupled with the building of most cars equipped with Hydra-Matic drive. These have combined to mark the sharp increase over 1952 percentagewise.

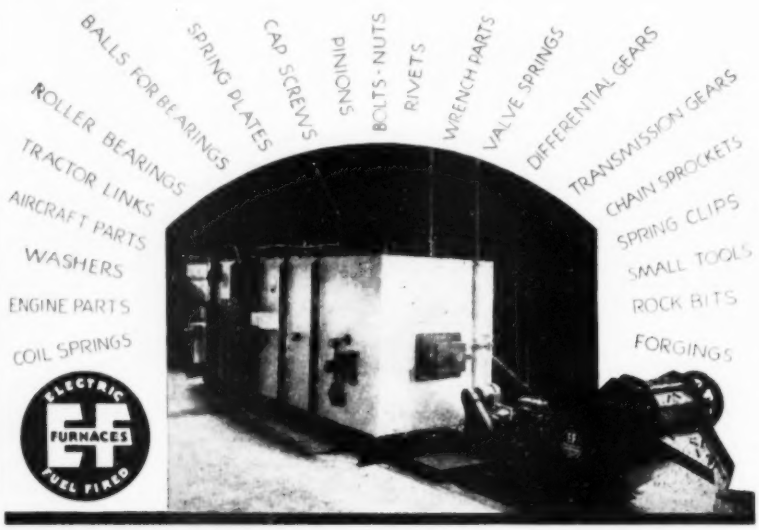
At Buick the only reason for the drop in automatic drive installations on 1953 Specials is that with increasing volume of production they have been unable to build Dynaflows in sufficient numbers to keep up with demand.

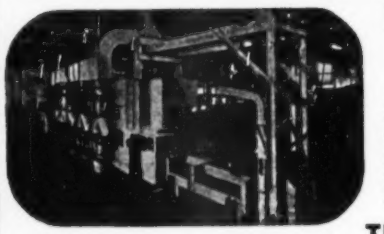
The same is true of some of the lower figures on power steering, particularly in the case of Oldsmobile in 1952. Low percentages reflect to a great extent an inability to meet increasing demand. In the case of Oldsmobile—the figure for 1953 (1st six months) shows the striking increase stemming from increased production of power steering gear assemblies. There is no question whatever as to acceptance on the part of car owners.

Turbine Car to Be Tested

General Motors plans to put a gas turbine in an experimental car next year. It will be a purely exploratory venture to find out more about the problems involved, and nothing is in sight for commercial production in the foreseeable future.

General Motors still feels that if there is any future in automotive turbines, it will be in commercial vehicles first. Even there the problems are still formidable, due principally to high fuel consumption.





EF Chain Belt Conveyor Furnace, Radiant Tube Gas Heated, Showing Labor Saving Loading Arrangement. (In the view at the top) Electrically Heated Furnace Showing Automatic Quench and Discharge.

For Hardening Small Parts
Uniformly—Scale Free—Continuously
175 to 2000 Lbs. per Hr.

The EF chain belt conveyor furnace is one of the most satisfactory continuous heating units yet devised for scale-free hardening, carbon restoration and non-decarb heat treating small and medium size parts. 11 standard sizes. Capacities to 2000 lbs. or more per hour. Gas, oil or electrically heated. Furnished complete with any desired feeding or discharging equipment. Write for folders describing our chain belt or other production furnaces.

THE ELECTRIC FURNACE CO.
WILSON STREET, SALEM, OHIO
Gas Fired, Oil Fired and Electric Furnaces
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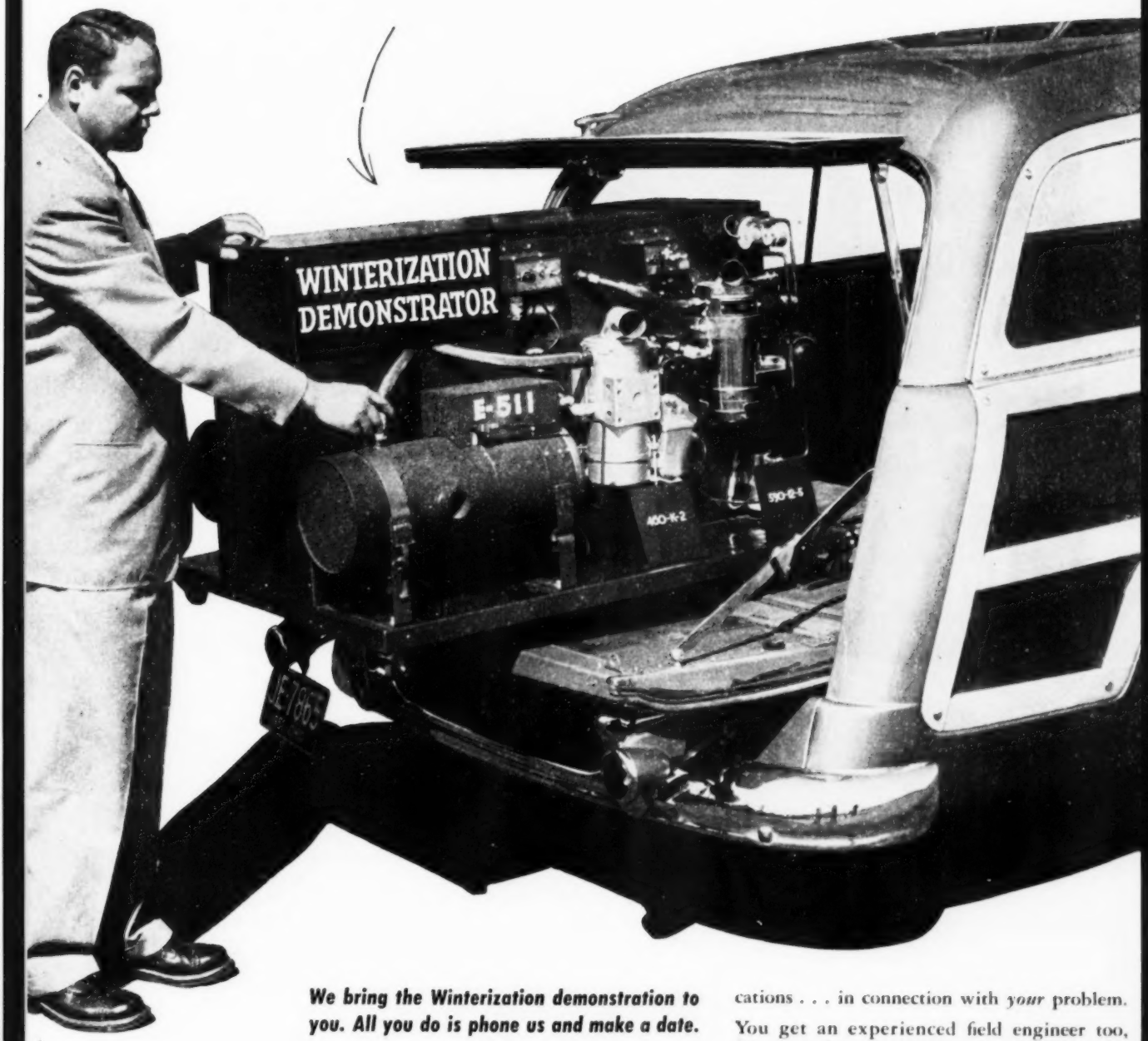
RIGHT AT YOUR DOORSTEP



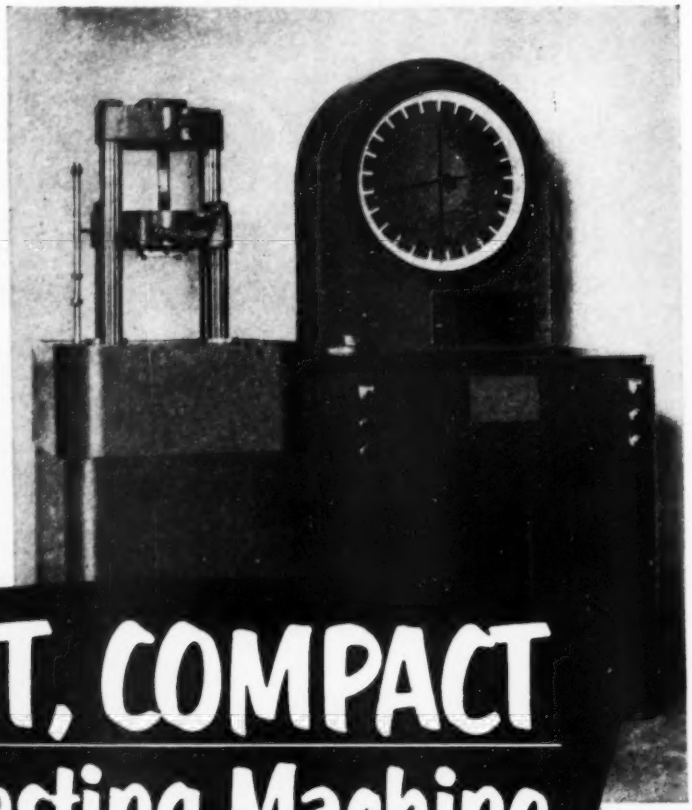
We bring the Winterization demonstration to you. All you do is phone us and make a date.

On Perfection's Mobile Demonstrator you can see five different types of heaters—which are the heart of our Winterization Systems—in actual operation. They include fresh air and coolant types ranging from 20,000 to 60,000 B.t.u. capacities. You can try them, pry into them, weigh the advantages of each . . . or modifications . . . in connection with *your* problem.

You get an experienced field engineer too, who can give you answers based on our 15 years of designing and producing winterization systems—over 100,000 installations—for all sizes and types of vehicles and equipment. Winterization Data File on request. Perfection Stove Company, 7392-E Platt Avenue, Cleveland 4, Ohio.

Perfection

Universal Testing Machine Model 60-H with T.E.G. load indicator



Now Baldwin Testing Headquarters Meets Your Needs With This New

LOW COST, COMPACT Universal Testing Machine

Recognizing your need for a low cost, faster and compact Universal Testing Machine, Baldwin-Lima-Hamilton Testing Headquarters developed Models 60-H and 12-H.

Quantity production makes possible fast deliveries and lower cost; nevertheless, the quality is so fine that its use in research laboratories is justified, particularly when equipped with the new T. E. G. load indicator.

With one of these new machines you would gain all of these advantages: (1) The first low cost machine which exceeds all minimum requirements for the routine testing job. (2) Faster, more rugged, more foolproof and able to stand more abuse than any comparable machine. (3) Operational damage prevented by simple safety devices. (4) One unit design with two unit features . . . will fit area only 67½" by 27"! Indicator housing supported independently to eliminate transmission of recoil. (5) Adjusting screws are completely enclosed in base and lubricated for life, eliminating worry and care. (6) Practically noiseless operation. Single knob control for loading and return.

For full information about the specifications and capabilities of this machine, write for our new Bulletin 4204 to: Dept. 2104, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

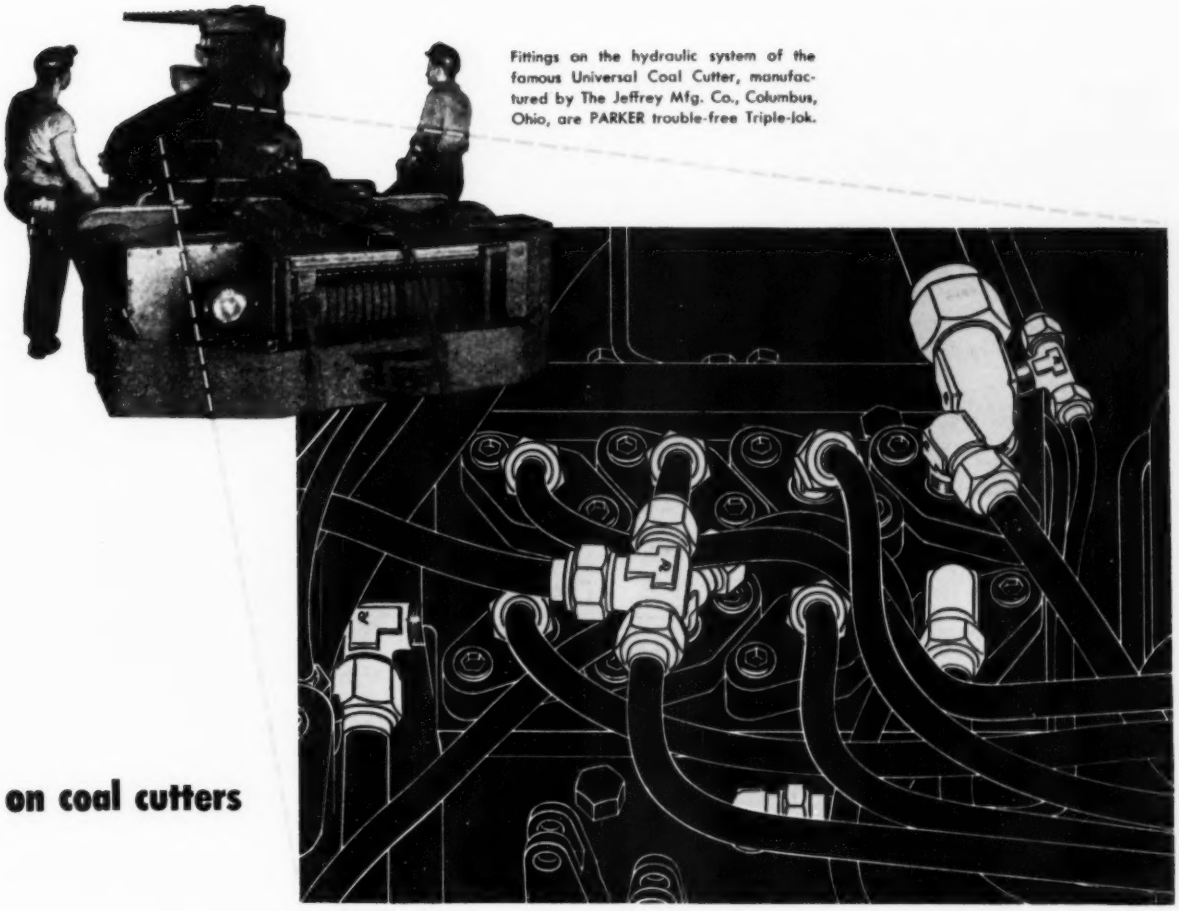
BALDWIN BLH LIMA-HAMILTON

TESTING HEADQUARTERS

BALDWIN-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. • Offices in Principal Cities

In Canada: Peacock Brothers, Ltd., Montreal, Quebec



Fittings on the hydraulic system of the famous Universal Coal Cutter, manufactured by The Jeffrey Mfg. Co., Columbus, Ohio, are PARKER trouble-free Triple-lok.

on coal cutters

Tube it up...Forget it...WITH PARKER

TROUBLE-FREE TRIPLE-LOK FITTINGS

Few machines get rougher use than coal cutters in coal mines. Subjected to severe vibration, caused by the action of the cutting head, and operating under the most adverse conditions, all parts must be ruggedly built, including the hydraulic system.

You'll find Parker Triple-lok Fittings on coal cutters and many other machines used in rough, rugged service because they are leakproof under the severest conditions of vibration, elevated temperatures, high pressures and repeated assembly. Parker Fittings meet the specifications of the A.S.M.E. Code for Pressure Piping, as well as J.I.C. and S.A.E. standards.

So *tube it up* and *forget it* . . . with Parker Triple-lok Fittings. Ask your Parker Distributor for Tube Fitting Catalog 4300, or write The PARKER Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio.

This does it

Triple-lok . . . 3-piece flare fitting famous for its sleeve . . . the easiest way to install tubing systems. Made in brass, steel, stainless steel, aluminum alloy.

Precision Mark of

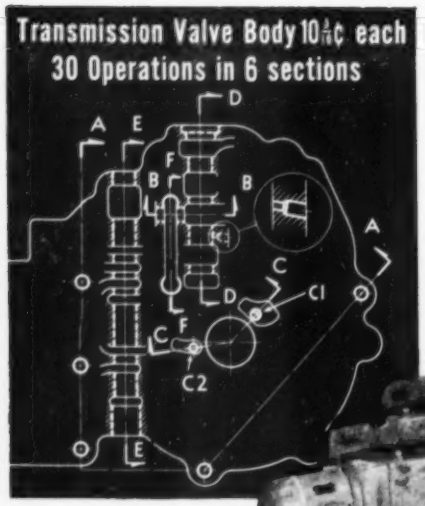
Leakproof Tube Fittings

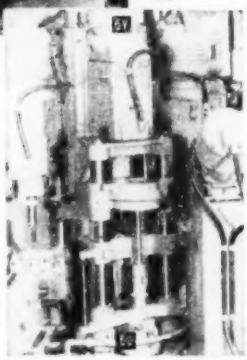
Parker

TUBE FITTINGS • VALVES • O-RINGS

Plants in Cleveland • Los Angeles • Eaton, Ohio • Berea, Ky.

Kingsbury give you

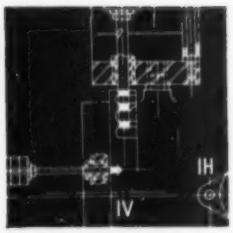


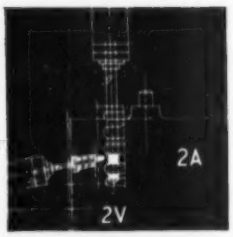


This Kingsbury central column machine has knees for mounting 3 Horizontal (H) Units and 8 Angle (A) Units. The central column mounts 11 Vertical (V) Units, one of which has two heads, one above the work and the other under it (U). Some of the units have multiple spindles. The 60-inch index table has 12 stations — one for loading and unloading.

The machine performs 30 operations: drilling, c'boring and reaming. Some of these are illustrated below.

This Kingsbury produces 176 pieces per hour gross at an average cost of 10.26¢ per piece.



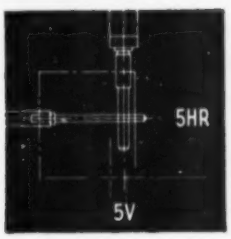


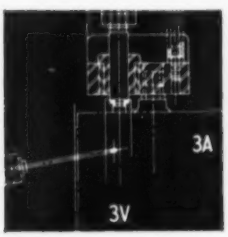
Follow this Transmission Valve Body

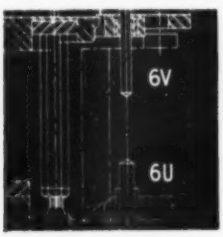
Section A: Unit 1H .281 drill — 5 thru-holes.

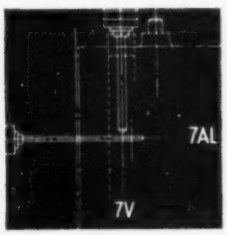
Section DD: Five vertical and three angle units prepare this long valve hole thru five walls. It must be straight, accurate, parallel with Section EE, and finished ready for borizing. Unit 1V .437 drills thru three walls; Unit 2V .437 drills thru the fifth wall. Units 4V and 5V rough- and semi-finish step-ream the hole. Unit 3V step-c'bores .812 and .640 at entrance to hole.

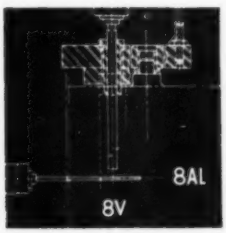
Angle units finish the port at the fourth wall. Unit 2A .156 drills 15/64 deep; Unit 3A .096 drills thru and Unit 10A .1115 reams this hole.











Special Purpose Machines are custom-built to high production at low cost

Units of 1/2 to 5 hp drill, ream, c'bore, mill, tap, thread — all accurately and economically

Operations are combined to insure accuracy, speed production, save money. The piece is chucked only once. It travels through the machine cycle, stopping successively at stations where Kingsbury Units complete their operations within predetermined time limits. At some stations several units work on the piece simultaneously. The operator loads and unloads the machine — there is no rehandling. Accurate machining reduces scrap. And think of the floor space saved!

If you have a suitable piece which requires a combination of these machining operations, it will pay you to investigate a Kingsbury. We can tell you whether or not we could develop a machine to make the piece in quantity at satisfactory cost. In fact, we would not tackle the job unless we could!

Kingsbury Machine Tool Corp.
102 Laurel Street, Keene, New Hampshire

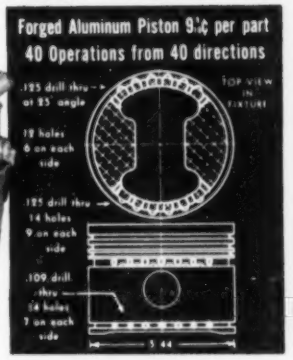
KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

Forged Aluminum Piston
60 Pieces per Hour Gross — 9-9/10¢ per Piece

This compact machine has a 60-inch base with 6 units mounted around a central work fixture. Operator loads the part, trips a valve and watches the machine go through an automatic cycle that takes 41 seconds.

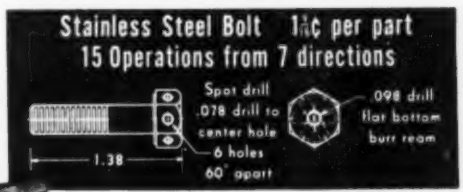
The piston indexes on its own axis. First index 26° 15′, then 5 indexes of 14° each to complete 12 angular holes in upper ring groove. Heads 1A & 4A do this work.

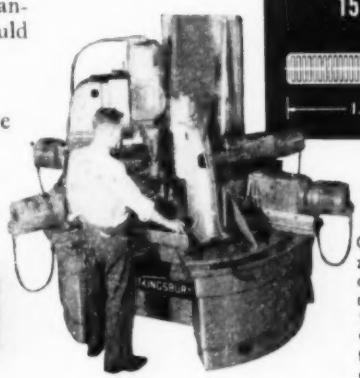

Forged Aluminum Piston 9¼¢ per part
40 Operations from 40 directions
TOP VIEW IN FIXTURE
.125 drill thru — at 25° angle
12 holes 6 on each side
.125 drill thru — 14 holes 9 on each side
.109 drill thru — 24 holes 7 on each side
5.44

Next index 16° then 1 index of 18° and 5 indexes of 14° complete 14 horizontal holes in lower ring groove. Heads 3H & 6H do this work.

Next index 43° 30′, then 6 indexes of 15° to complete 14 horizontal holes in upper ring groove. Heads 2H & 5H do this work.

Now index 26° 15′ to bring work to loading position. Machine stops automatically, job is finished.


Stainless Steel Bolt 1¼¢ per part
15 Operations from 7 directions
Spot drill
.078 drill to center hole
6 holes 60° apart
1.38
.098 drill flat bottom burr ream



Stainless Steel Bolt
460 Pieces per Hour Gross — 1-9/10¢ per Piece

On an 80-inch diameter base, four horizontal and two vertical units spot drill, drill thru, flat-bottom and burr-ream as required. The 12-inch index table has 12 work fixtures, and each rotates clockwise. Work fixtures rotate 90° when the table indexes 30°. Bushing carriers insure accuracy.

through 30 operations — with only one chucking

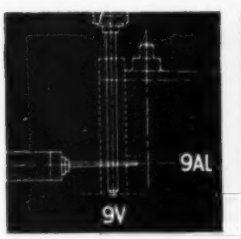
Section EE is another long valve hole thru nine walls, prepared for borizing. Vertical units perform 7 operations.

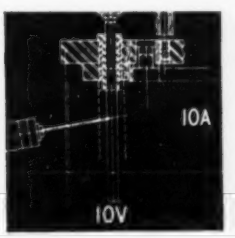
Unit 6V .422 undersize drills down thru two walls. Unit 6U .625 drills up thru ninth wall. Unit 7V .421 drills down thru three more walls. Unit 8V .4531 end-reams the hole thru five walls. Unit 9V .453 drills the hole thru. Units 10V and 11V .4687 rough end-ream and .4882 semi-finish ream the hole.

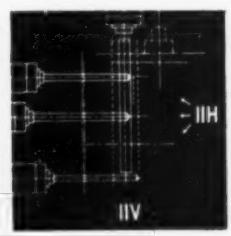
Section FF: Unit at 11H drills .343 dia. and .281 dia. partial holes shown; and four .281 dia. holes not shown.

Section BB: Unit 5H Right .312 drill thru both walls.

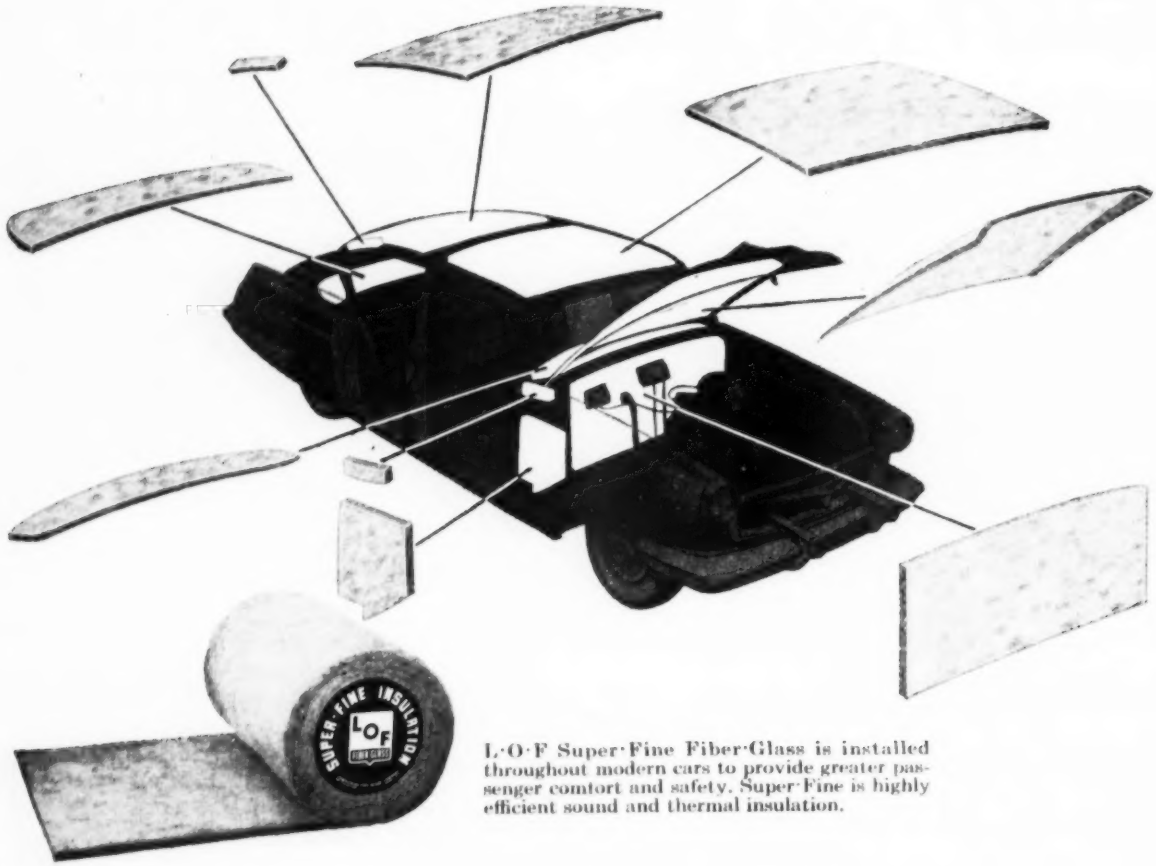
Section CC: Unit 5A Right .218 drills hole C1 full depth. Four Units operate on step-hole at C2; Unit 5A Left .060/.065 drills thru; Unit 7A Left .156 drills 17/32 deep; Unit 8A Left .094 drill undersize, and Unit 9A Left .094/.096 reams the hole.







Each Unit Cost on the drawings
includes the cost of the man and of the machine — no power or overhead. We assumed:
Unit cost of man equal to:
$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$
Unit cost of machine to be:
$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% efficiency}}$$



L·O·F Super·Fine Fiber·Glass is installed throughout modern cars to provide greater passenger comfort and safety. Super·Fine is highly efficient sound and thermal insulation.

Your final step in muting high-frequency engine noise!

The successful effort to quiet an engine begins with attention to moving parts, and ends with a blanket of L·O·F Super·Fine Fiber·Glass installed under the hood and on the fire wall. There are few owner satisfactions to compare with an engine that never speaks above a whisper.

Inherently suited to those applications, L·O·F Super·Fine muffles high-frequency engine noise, tire whine, airstream whistle, helps block heat passage into car body. The glass fibers resist fire, oil, grease and most acids.

Other applications of L·O·F Super·Fine Fiber·Glass —liners in roof, under package trays, on dashboard—further support your continuing effort to offer customers engines that speak only in whispers and auto bodies that offer increased passenger comfort.

On your production lines, featherweight L·O·F Super·Fine is easily handled, quickly applied without lost motion. Of course, it almost goes without saying that you can depend on Libbey·Owens·Ford, with its long automotive experience, to deliver top-quality Super·Fine Fiber·Glass right on schedule.

For further information, call L·O·F's Detroit Office, 610 Fisher Building, TRinity 5-0080. Or write us for the names of Hoodliner-Kit suppliers. Libbey·Owens·Ford Glass Company, Fiber Glass Division, 773 Wayne Building, Toledo 3, Ohio.

LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION

L·O·F GLASS PLASKON FIBER·GLASS

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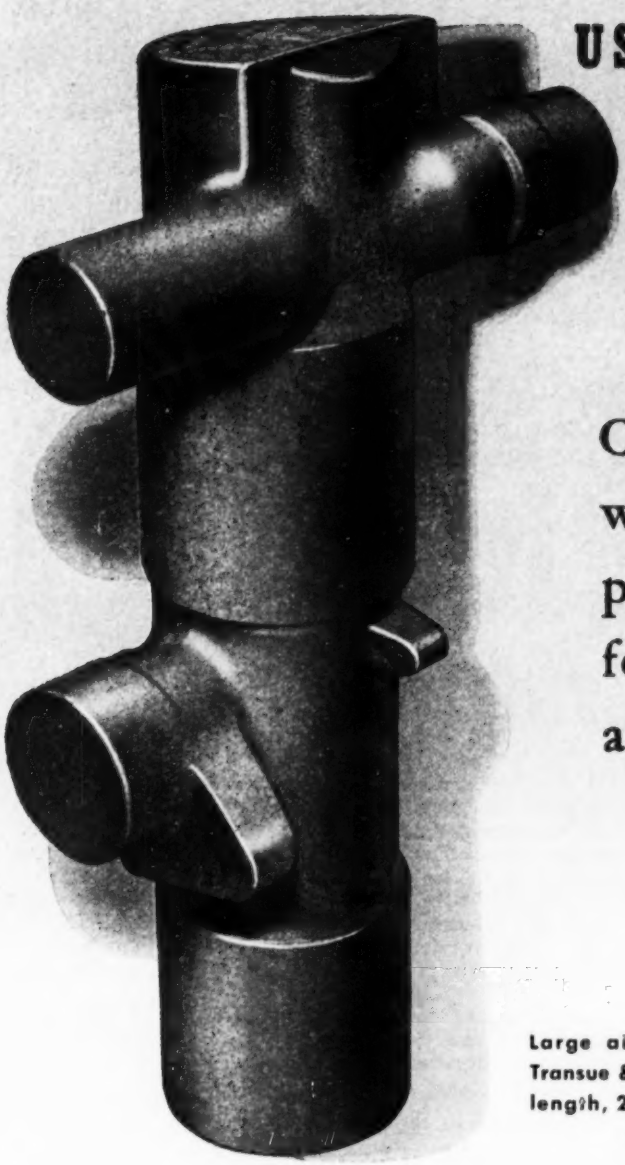
TRANSUE FORGINGS



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Consult our engineers when you are contemplating conversion to forgings or when you are in need of reliable forging service.

Large aircraft forging produced by Transue & Williams... Weight, 320 lbs.; length, 29 inches; width across the T section, 17½ inches.

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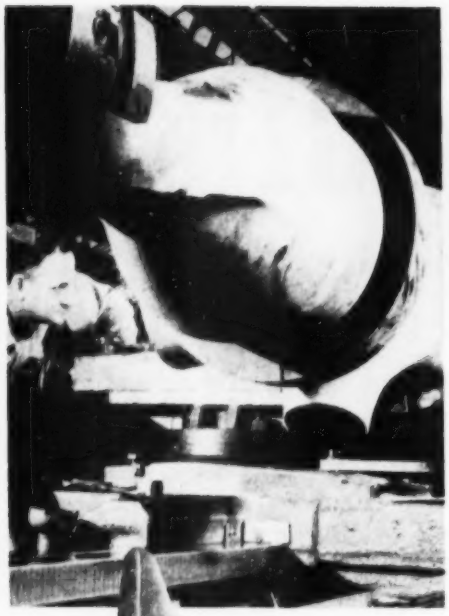
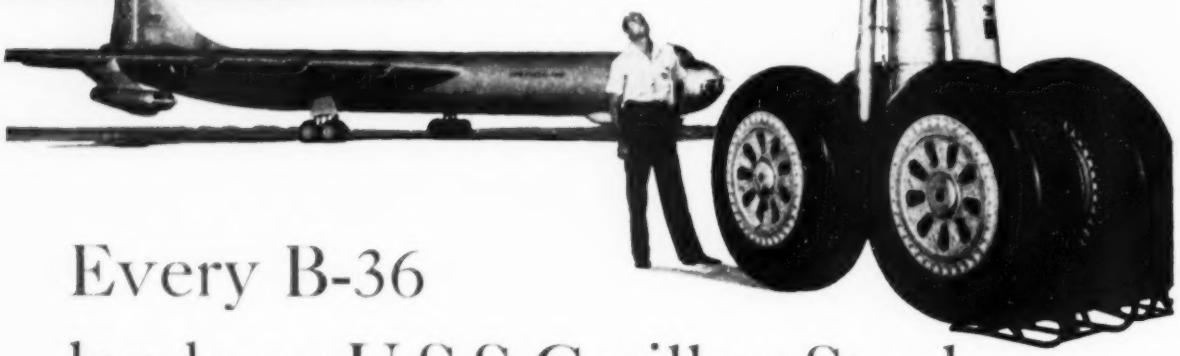


U·S·S CARILLOY electric-furnace aircraft quality steel meets every requirement for these vital parts. The precision machining and expert heat treatment they get at Cleveland Pneumatic Tool Company complete the job.

NO ORDINARY STEEL could withstand the huge shock loads imposed on the main landing gears of Convair's giant Air Force B-36 Bomber. The plane has a maximum gross weight of 358,000 lbs., with still higher landing shock loads. But U·S·S CARILLOY steel has more than enough impact strength to hold up under this severe punishment.



Every B-36 lands on U·S·S Carilloy Steel

WHEN 179 tons of B-36 thump down on a landing strip, tremendous stresses are built up in the structural parts of the landing gear. Only the highest quality in steel can handle this tough job, which is one of the most exacting in the aircraft industry.

All of the rugged main columns for these landing gears are made from U·S·S CARILLOY electric-furnace aircraft quality ingots. This high quality alloy steel provides the great strength and shock resistance demanded in the performance of the finished part. The main columns for these landing gears are forged. The original ingot, as shipped to the forger, weighs approximately 37,500 lbs. From it are produced two columns, each weighing about 1200 lbs. In other words, approximately 93% of the steel has been removed—with a mere 7% of the original ingot left to do this tremendous job. Obviously, only steel of the very best quality can meet such exacting requirements.

The same care and skill go into every ton of CARILLOY steel that *you* buy, whether it's a giant alloy ingot or a few tons of special steel. Our experienced metallurgists keep a close check on *every* heat of steel to make sure it has the strength, hardness, toughness and machinability that's needed.

If you have a special steel problem, let us know. We'll be glad to help you with it.

UNITED STATES STEEL CORPORATION, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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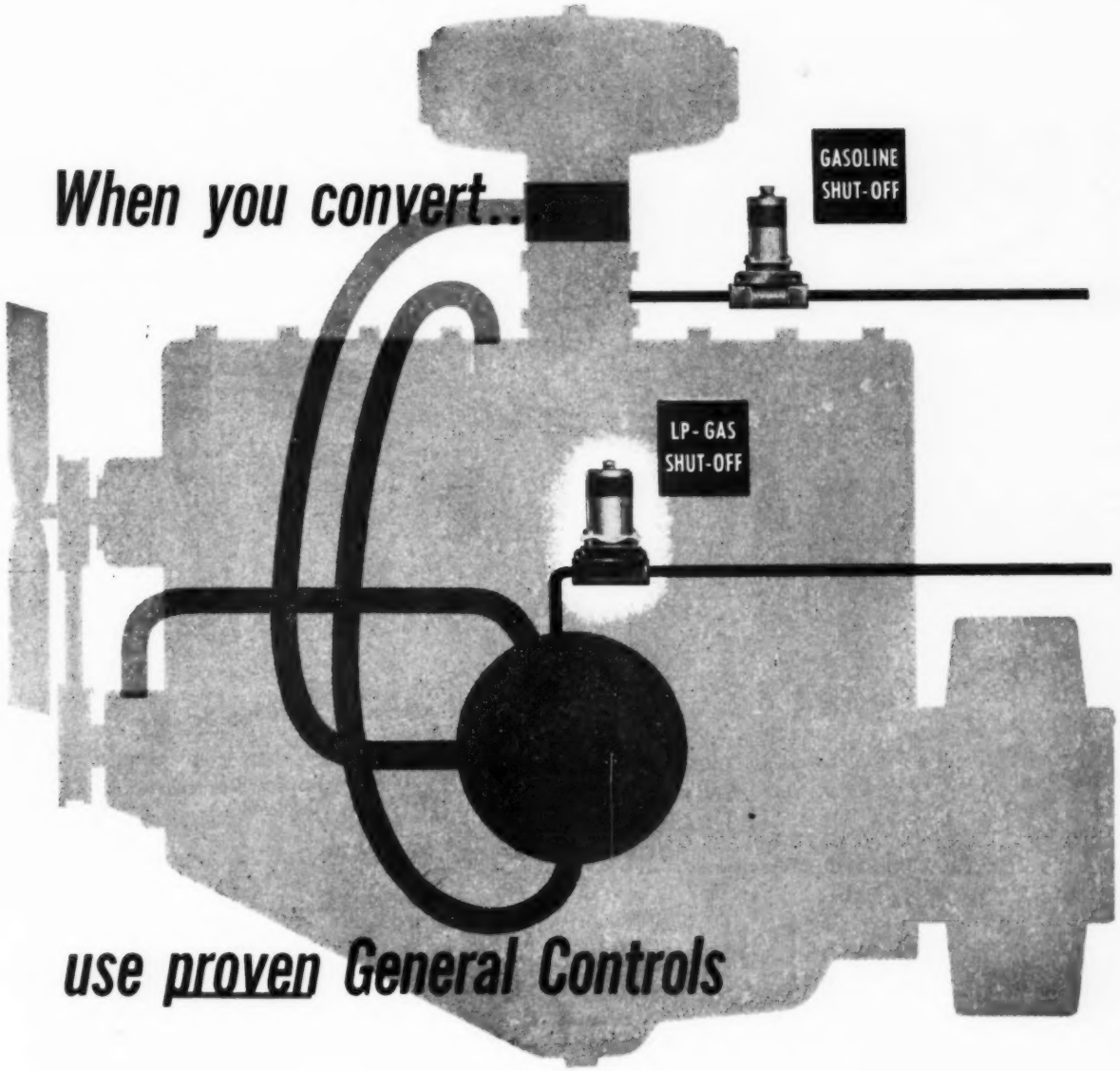
USS **Carilloy Steels**

ELECTRIC FURNACE OR OPEN HEARTH — COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

3-1216

UNITED STATES STEEL



Be sure the controls are economical. Be sure they're effective. Be sure they're safe. Be sure you choose pre-tested, pre-proven General Controls Valves.

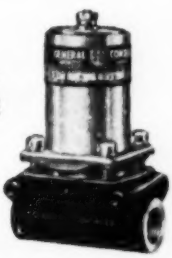
General Controls PV-1C gasoline and propane shut-off valves are normally closed and may be operated in any position, having been designed originally for critical aircraft applications.

Continuous duty solenoids, soft-seated valves and other high performance features assure faultless operation at 10 psi for gasoline and 300 psi for LP-Gas.

Resistant to the shock, vibration and heat of heavy duty mobile equipment, PV-1C Shut-off Valves offer you efficiency and safety factors far in excess of usual field requirements.

Be sure you realize the full advantages of conversion by using these dependable, proven General Controls valves.

GENERAL CONTROLS PV-1C
PROPANE SHUT-OFF VALVE



GENERAL CONTROLS

Glendale 1, California — Skokie, Illinois

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

FACTORY BRANCHES IN 32 PRINCIPAL CITIES

SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

Sightseers get **all** of the view...

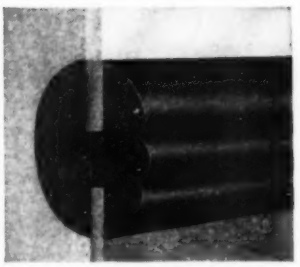
but **none** of the weather!

Sight-seers in this Sight-Seeing Coach see as much as folks who rode atop the classic tallyho! But what a difference! Those earlier riders were drenched to the skin by the shortest summer showers. But today's travelers, enjoying the scenery, ride out the worst storms in perfectly dry comfort. All *this* . . . because the top is composed largely of curved picture windows, each protected completely and permanently by the *one perfect seal* . . . Inland Self-Sealing Weather Strip! It *never* leaks . . . NEVER!

That's why so many cars, buses and trucks, other vehicles and structures, use Inland Strip on windshields and fixed windows. It's the basic Inland *principle* that does it . . . the natural resilience of rubber, permanently compressed . . . a seal that locks itself for keeps, without cement or binders.

Inland Strip is *best* for the builder . . . a fast, one-man, low-cost installation. And *best* for the user . . . long-lived, trouble-free, inexpensive when replacing broken glass.

INLAND MANUFACTURING DIVISION • General Motors Corporation • Dayton, Ohio



Here's how it works!

Inland Strip goes into body panel or other opening . . . glass into Strip . . . filler strip into locking channel. *A compression seal that's complete and permanent!*

INLAND MANUFACTURING

Self-Sealing WEATHER STRIP

McLouth
STAINLESS
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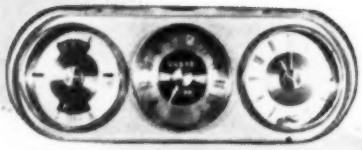
For the product you make
today and the product you
plan for tomorrow.

McLouth Steel Corporation
DETROIT, MICHIGAN
Manufacturers of Stainless and Carbon Steels



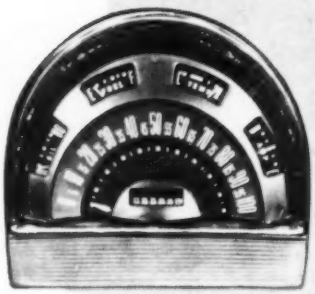
K-S equipment has a record for

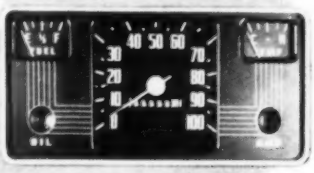
DEPENDABILITY

Today K-S automotive gauges and speedometers are standard equipment on 17 makes of passenger cars, trucks and buses—about 30% of this country's production. And the majority of these vehicle manufacturers have used K-S equipment for 15 years or more—some for more than 20 years.

This widespread acceptance of K-S products is the result of progressive engineering and precision manufacturing—K-S know-how. The continued use of K-S products for such long periods definitely indicates performance that is consistently satisfactory.

When you standardize on K-S automobile gauges, speedometers and instrument clusters, you offer your customers this same dependable performance.

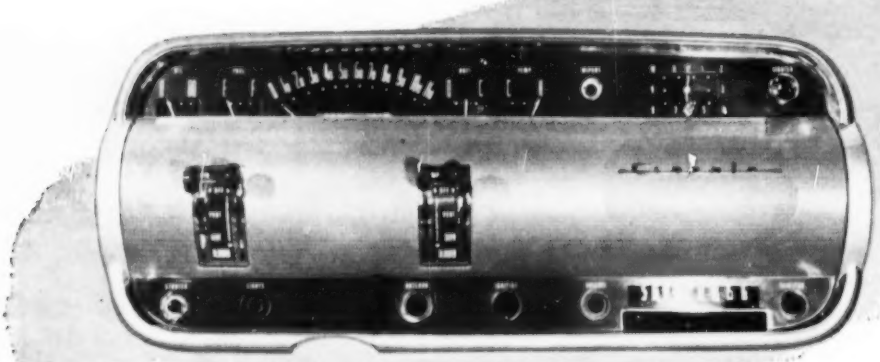




KING-SEELEY CORPORATION

ANN ARBOR, MICHIGAN

Plants at ANN ARBOR, SCIO and YPSILANTI



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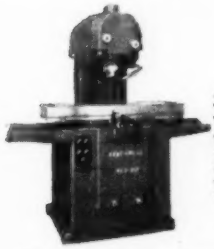
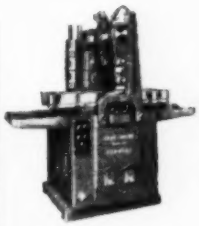
Speed and Accuracy!

No. 2-20
20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.

More and more—Kent-Owens Machines get the call for countless milling jobs today—because they're *rugged . . . simple . . . versatile.* Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to cutter. Write for bulletins on wide range of hydraulic and hand-operated machines. Also, let our engineers help you with tooling and special machine requirements. Kent-Owens Machine Co., Toledo, Ohio.



No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M.... 42" x 12" table.



No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel . . . 42" x 12" table.

No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.

No. 1-M
Hand feed to table and head ... 25" x 9" table . . . Adjustable head counter-balance.

No. 1-V
Hydraulic vertical head feed... 5½" head travel . . . 25" x 9" table.

No. 1-8
8" table travel . . . 25" x 9" table . . . automatic hydraulic table feed.

No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Call on KENT-OWENS for milling machines

KENT-OWENS REPRESENTATIVES

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Four States Mach'y Company

DALLAS
Hunter Machine Tool Co.

DAYTON
Geniger Mach'y Company

DETROIT
A. C. Habeckers Mach'y Co.

FT. WAYNE
Owen Machinery Co.

GRAND RAPIDS
Joseph Monahan

HAMILTON, ONT.
F. F. Barber Mach'y Company

HARTFORD
Harrington Machinery, Inc.

HOUSTON
Oliver H. Van Horn Co., Inc.

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Geoman Mach'y Co.

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MOLINE
John J. Normoyle Co.

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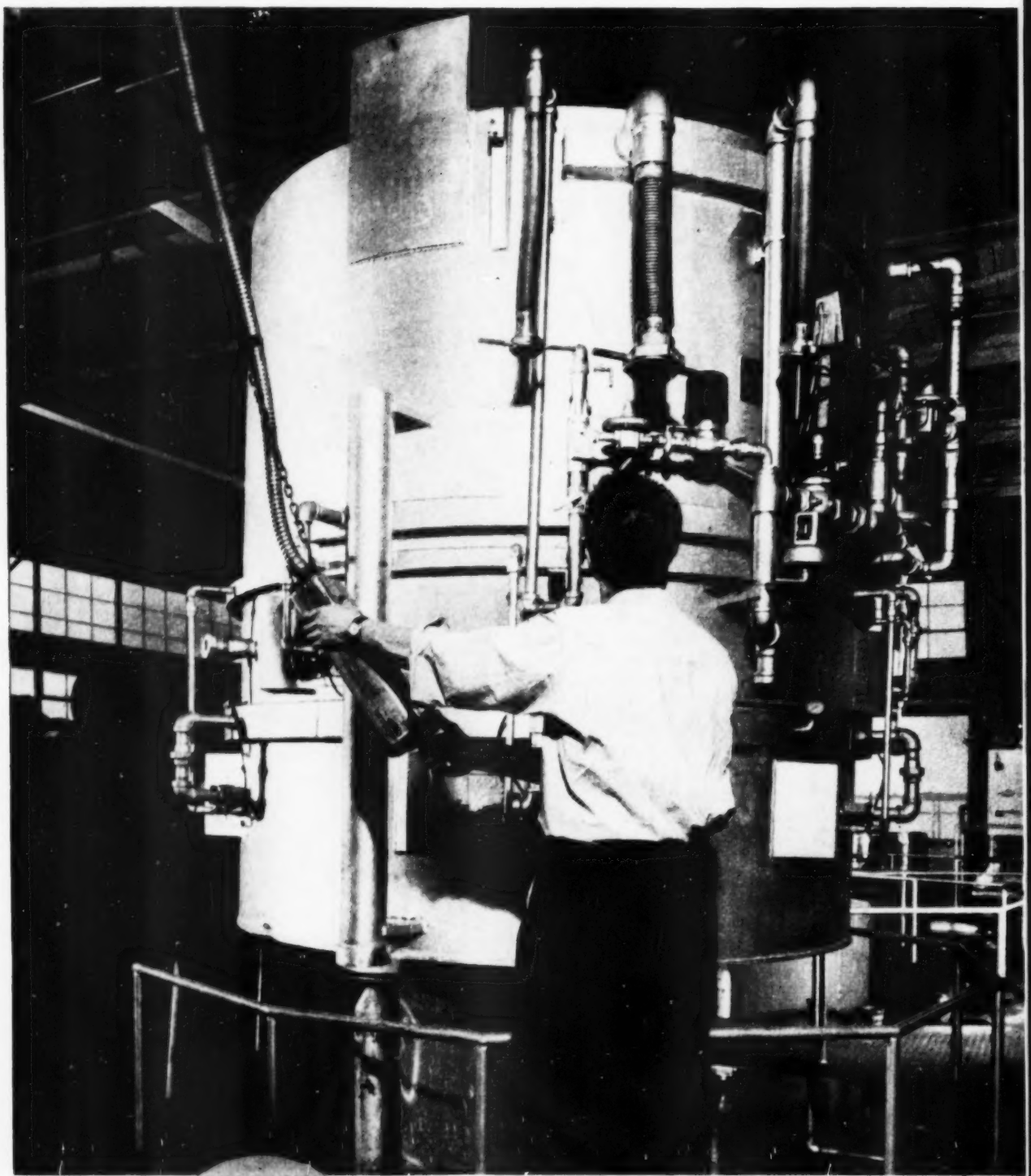
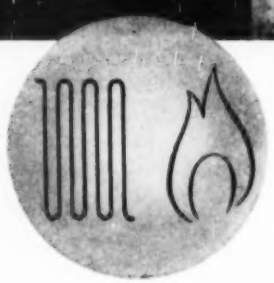
WALKERVILLE, ONT.
F. F. Barber Mach'y Company





IF YOUR PRODUCT CALLS FOR HEAT-TREATING . . . IT CALLS FOR A WESTINGHOUSE FURNACE . . . GAS OR *ELECTRIC.*

"Top-quality control with new furnace"

says . . . Rodney Metals, Inc.

"Before acquiring our Westinghoue Bell-Type Furnace we had to depend on outside sources for the bright annealing of our steel stock. This would frequently result in costly delays. Now that we have our own furnace we avoid all breakdowns of production schedules.

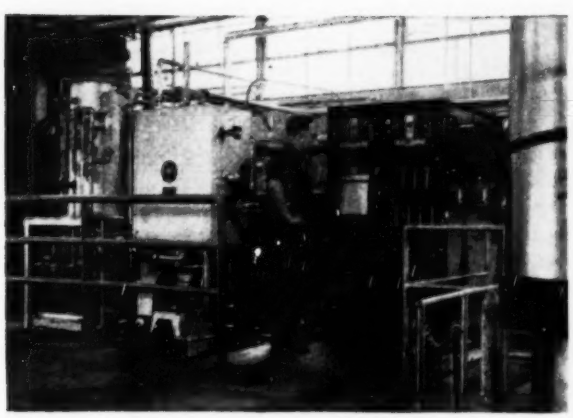
"In a matter of hours, with our Westinghouse integrated operation, our sheet steel warehouse can supply any specific gauge and hardness to the parts manufacturing operation of our affiliated company, Modern Venetian Blinds, Inc. To maintain the high-quality standards of Modern's venetian blind hardware products, it is mandatory that our steel, after annealing, be of uniform hardness and "bright"—free from scale. We have been able to maintain this top-level quality control with our Westinghouse Bell-Type Furnace."

Investigate Westinghouse Heat-Treating Furnaces. Whether it be for your production line, toolroom or laboratory, you'll get the heat-treating flexibility you need and want with Westinghouse Heat-Treating Furnaces . . . GAS or ELECTRIC.

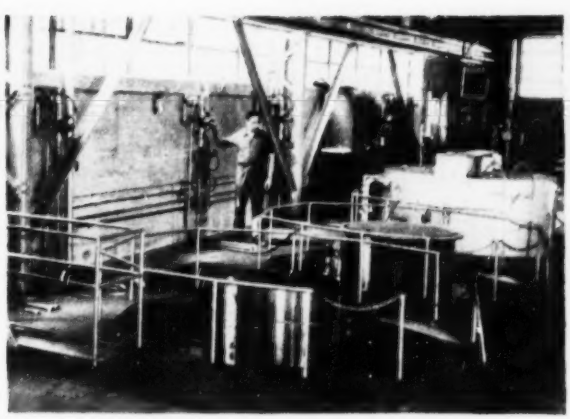
For more information regarding Westinghouse Heat-Treating Furnaces, write today for your copy of the 40-page booklet, *Harnessing Heat* (B-5459) Westinghouse Electric Corporation, Industrial Heating Department, Meadville, Pennsylvania. J-10399

YOU CAN BE **SURE**... IF IT'S

Westinghouse



Exogas® atmosphere generator and control panel used in conjunction with the Westinghouse Bell-Type Furnace. This generator and control panel give constant atmosphere control and absolute temperature reliability.



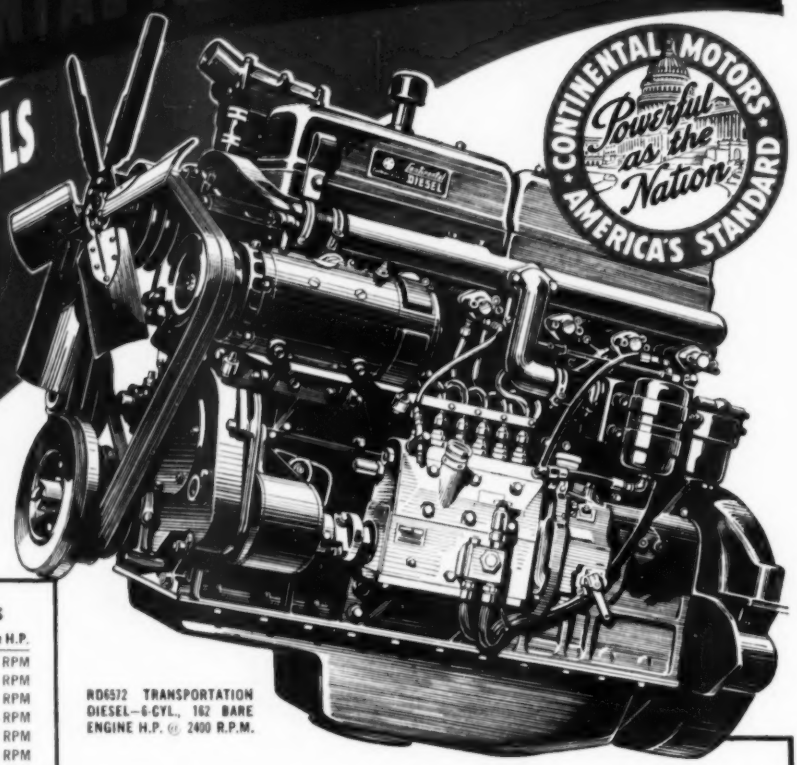
This is a three-base installation with one Bell, allowing continuous operation. One batch being annealed; one batch cooling under hood; a third batch unloading from base.

YOU'LL GO FAR

with CONTINENTAL RED SEAL POWER

28 BASIC MODELS FOR TRUCKS AND BUSES

CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD



RD6572 TRANSPORTATION DIESEL—6-CYL., 162 BARE ENGINE H.P. @ 2400 R.P.M.

TRANSPORTATION GASOLINE ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
N4062	4	2⅛	3½	62	26 @ 3400 RPM
Y4069	4	2½	3½	69	28 @ 3400 RPM
Y4091	4	2⅞	3½	91	36 @ 3400 RPM
F4124	4	3	4⅛	124	47 @ 3200 RPM
F4140	4	3⅛	4⅛	140	52 @ 3200 RPM
F4162	4	3⅜	4⅛	162	58 @ 3200 RPM
F6186	6	3	4⅛	186	77 @ 3500 RPM
F6209	6	3⅛	4⅛	209	90 @ 3500 RPM
F6226	6	3⅛	4⅛	226	99 @ 3500 RPM
M6271	6	3⅛	4⅛	271	97 @ 3000 RPM
M6290	6	3¼	4⅛	290	108 @ 3000 RPM
M6330	6	4	4⅛	330	125 @ 3000 RPM
K6271	6	3⅛	4⅛	271	115 @ 3200 RPM
K6290	6	3¼	4⅛	290	123 @ 3200 RPM
K6330	6	4	4⅛	330	145 @ 3200 RPM
B6371	6	4⅛	4⅛	371	124 @ 3000 RPM
B6427	6	4⅜	4⅛	427	142 @ 3000 RPM
T6371	6	4⅛	4⅛	371	144 @ 3000 RPM
T6427	6	4⅜	4⅛	427	170 @ 3000 RPM
U6501	6	4½	5¼	501	178 @ 2600 RPM
R6513	6	4½	5⅛	513	180 @ 2800 RPM
R6572	6	4¼	5⅛	572	200 @ 2800 RPM
R6602	6	4⅛	5⅛	602	212 @ 2800 RPM
S6749	6	5⅛	5½	749	250 @ 2800 RPM
S6820	6	5⅛	5½	820	275 @ 2800 RPM

TRANSPORTATION DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
TD6427	6	4⅜	4⅛	427	116 @ 2400 RPM
RD6572	6	4¼	5⅛	572	162 @ 2400 RPM
SD6802	6	5⅜	5½	802	217 @ 2200 RPM

When you choose a vehicle powered by Continental Red Seal engine, you tap a reservoir of experience unsurpassed in the engine-building field. Continental, and Continental only, delivers the balanced combination of power, economy, dependability and long life resulting from all these features—an array found nowhere else:

Patented individual porting . . . full-length water jacketing with directional coolant flow . . . full-pressure lubrication . . . leakproof water pump . . . patented oil and dust seals . . . sodium-filled positive-rotation exhaust valves, stellite-faced . . . dynamically-counterbalanced crankshaft with Tocco-hardened journals . . . five-ring light alloy pistons with chrome-plated top ring . . . all these, and countless other quality features evolved through the years.

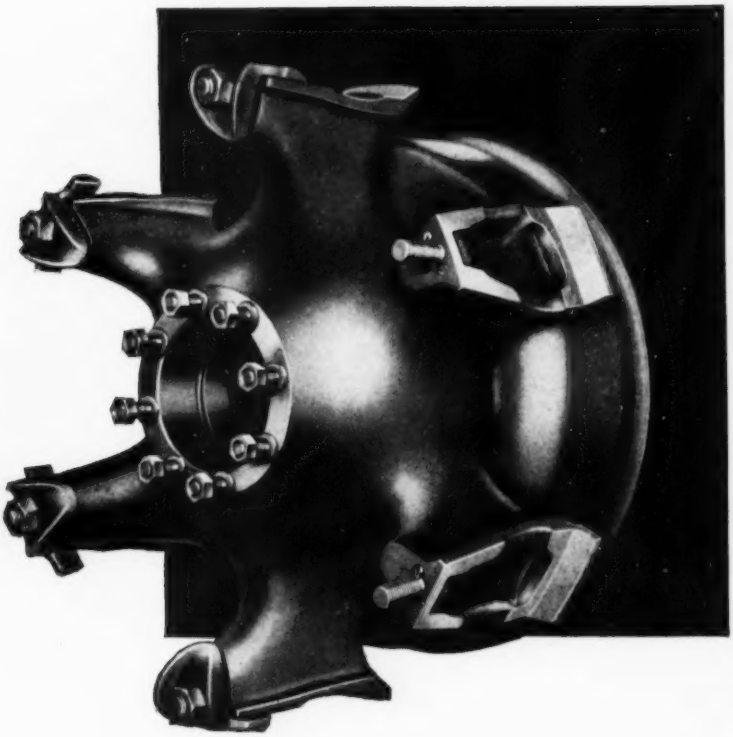
•

FOR MOST MILES, LOWEST TON-MILE COSTS, AND THE BACKING OF COUNTRYWIDE SERVICE, CHOOSE A MAKE WITH RED SEAL POWER.

Continental Motors Corporation

MUSKEGON, MICHIGAN

GUNITE WHEELS



Take Bigger Loads Over Rougher Roads

● . . . save vital pounds, too!

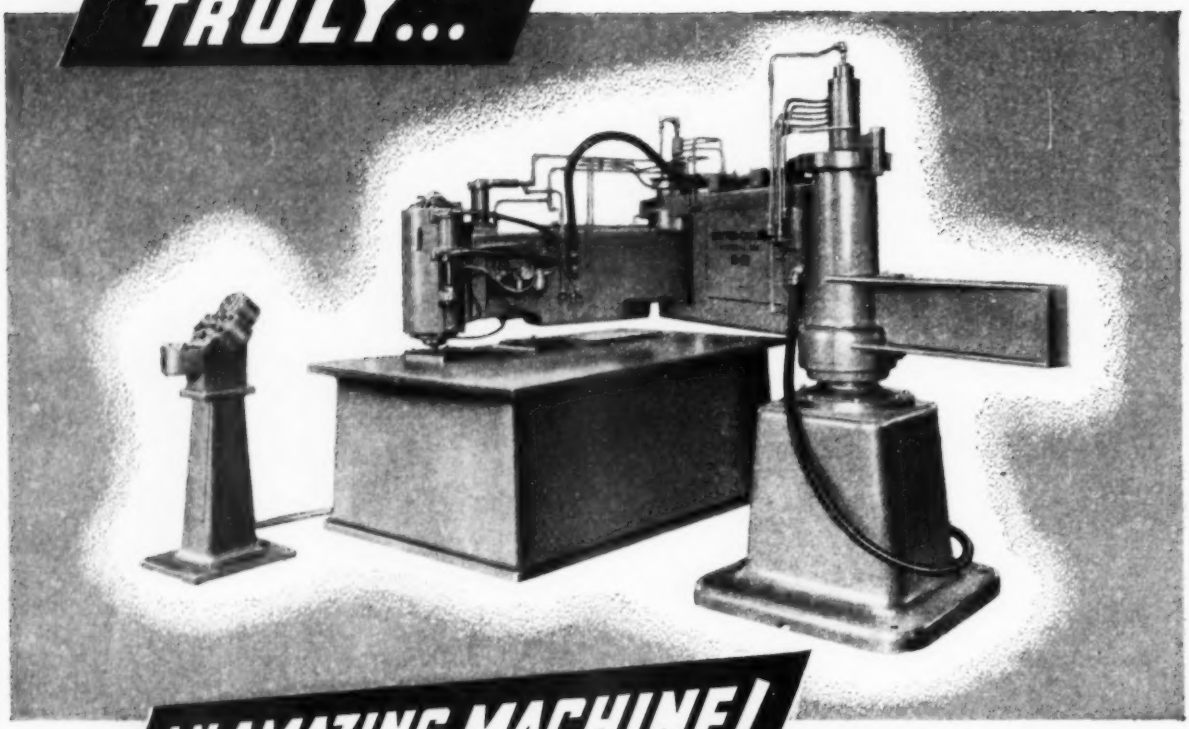
There are two important reasons why Gunite truck and trailer wheels provide dependable heavy-duty service . . . while assuring minimum unsprung weight. One is the *metal* . . . precisely controlled castings are used to make Gunite wheels strong and rigid . . . ready to withstand the toughest road abuse. The other is Gunite's *tubular spoke design* . . . which creates maximum strength through accurate weight distribution • Gunite tubular-spoke wheels are rugged . . . yet, save vital pounds . . . cut per mile operating costs. Six low-torque floating rim bolts eliminate servicing headaches. Specify Gunite lightweight cast-steel wheels for your rigs.

They'll save you money at no premium in price.

GUNITE

GUNITE FOUNDRIES CORPORATION, Rockford, Illinois

TRULY...



AN AMAZING MACHINE!

EKSTROM, CARLSON

H-121 "POWER-ARM"

CONTOUR ROUTING *and* MILLING MACHINE

Powerful!
Fast-cutting!
Easy to Operate!

Do you want to banish, forever, tedious, *back-breaking* manual routing in the machining of your aircraft parts? Then, *here's* EKSTROM, CARLSON's solution! This machine, conceived by us, is specially designed to provide greater production at lower cost when template-routing and milling today's heavy aluminum plate or thick stacks of tough-cutting aluminum sheets. Hydraulically-operated, the entire operation is effected from a "Utopian" remote control pushbutton stand that starts the motors, lowers the head for template contact prior to the actual cutter descent, and controls the speed, rapid traverse, and direction of travel. The spiral-flute, collet-mounted router bit (also an ECCo product) is direct-driven by a high-cycle, 30 hp motor at 14,400 rpm. Even an inexperienced operator can quickly learn how to "pilot" the head around the most intricate template, and can then proceed to turn out an amazing quantity of work. For further details on this entirely new and revolutionary machine, write us *TODAY* . . . and learn all about it!

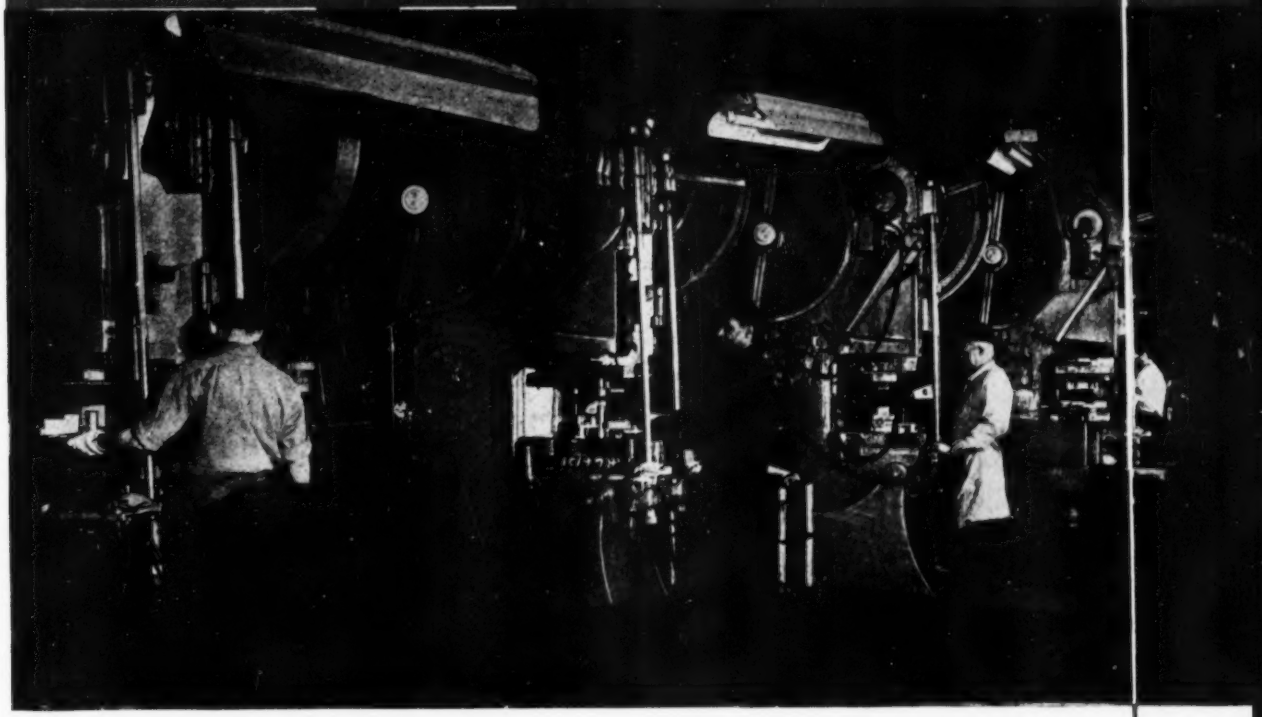
ECCO

DEPT. A-3
EKSTROM, CARLSON & CO.
1400 Railroad Ave.
Rockford, Ill.

FOR GREATER AIRCRAFT PRODUCTION!

At Art Steel Company, too,

BLISS Presses Predominate



97% are Bliss-Built

Now, Art Steel Company, one of the leading manufacturers of steel office equipment — *Steelmaster* — credits Bliss with an important role in its progress. For Art Steel has looked to Bliss since 1923 for engineering counsel and the right press for each operation. Seventy-three Bliss presses making up 97% of Art Steel's press equipment attest to the fact that Bliss has justified this confidence.

Asked *why the continued preference for Bliss presses*, Art Steel officials sum it up in one word — "*dependability*".

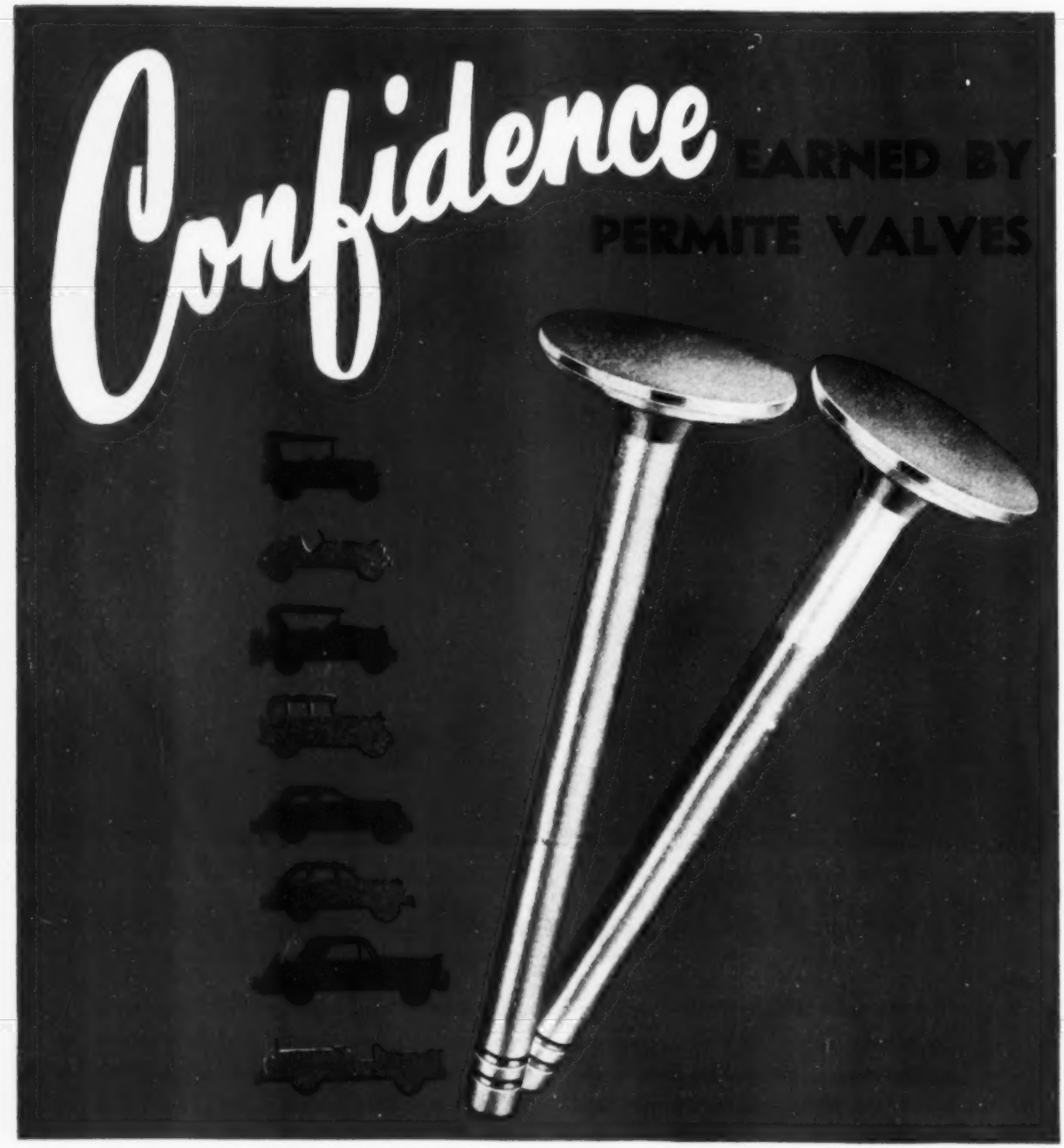
And that's why hundreds of sheet metal plants throughout this country and abroad specify Bliss presses more than any others. Whether your requirements involve mechanical or hydraulic presses . . . high speed or normal speed . . . straight side or gap frame . . . it pays to call for a Bliss engineer. He can show you why Bliss belongs in *your* press room, too.

E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan. Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Co., Los Angles and San Francisco; Star Machinery Company, Seattle. Other representatives throughout the world.

• • •

BLISS on your press is more than a name ...it's a guarantee!



PERMITE

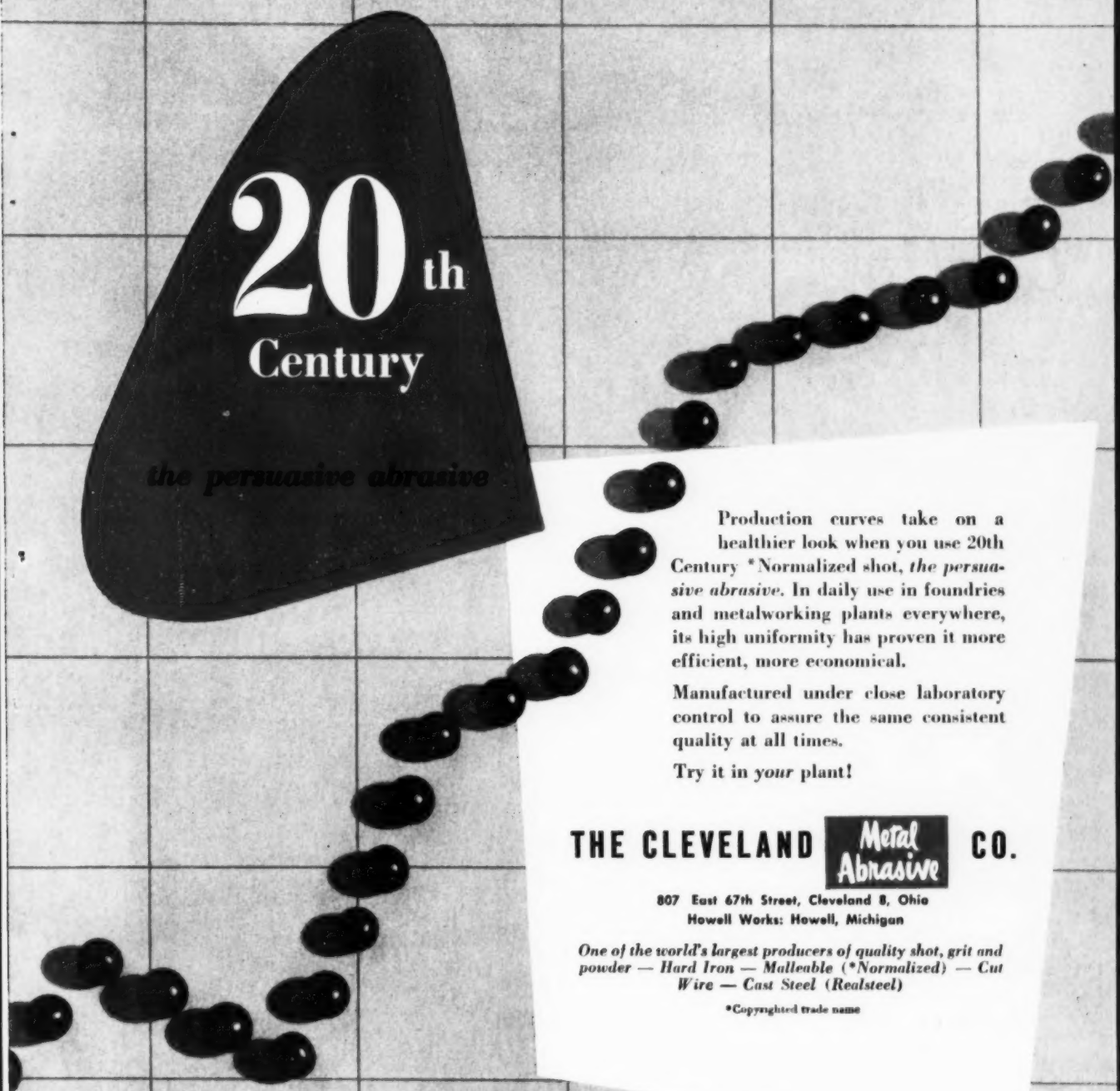
The confidence which automotive engineers have in Permite Valves has been earned through many years of dependable service to the automotive industry. Valves, pistons and other parts by Permite have contributed to the amazing advance in engine performance, as one improved model after another has been introduced during the past one-third century. We invite your requests for consultation and estimates on parts requirements.

ALUMINUM INDUSTRIES, Inc. . . . Cincinnati 25, Ohio

Detroit: 809 New Center Building — New York: 9 Rockefeller Plaza

Chicago: 64 E. Jackson Boulevard

ALUMINUM PERMANENT MOLD AND SAND CASTINGS . . . HARDENED, GROUND AND FORGED STEEL PARTS



Production curves take on a healthier look when you use 20th Century *Normalized shot, *the persuasive abrasive.* In daily use in foundries and metalworking plants everywhere, its high uniformity has proven it more efficient, more economical.

Manufactured under close laboratory control to assure the same consistent quality at all times.

Try it in *your* plant!

THE CLEVELAND Metal Abrasive CO.

807 East 67th Street, Cleveland 8, Ohio
Howell Works: Howell, Michigan

*One of the world's largest producers of quality shot, grit and powder — Hard Iron — Malleable (*Normalized) — Cut Wire — Cast Steel (Realsteel)*

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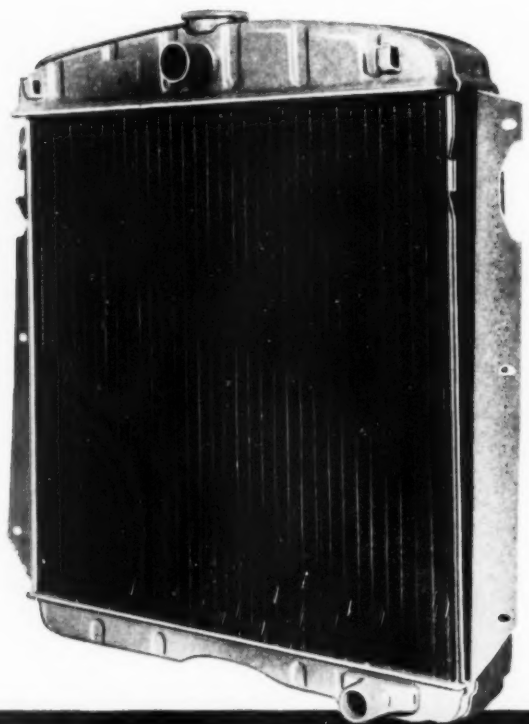
Cooling Problems?

Harrison has the answers!

Forty-two years ago we began the design and manufacture of units for automotive cooling systems.

Today—fifty-three million radiators later—our accumulated knowledge and experience, plus our modern research and testing facilities, qualify us to handle any automotive cooling requirement.

Take your cooling problems to Harrison . . . for Harrison has the answers!



HARRISON
RADIATOR
DIVISION
GENERAL MOTORS CORPORATION
LOCKPORT NEW YORK

HARRISON

Send for free print

First four-wheeled Benz, the "Victoria," had exposed chain drive, three-piece front axle with main shaft and two steering knuckles, vertical one-cylinder motor. Triple carriage lamps provided good illumination. The year—1893.

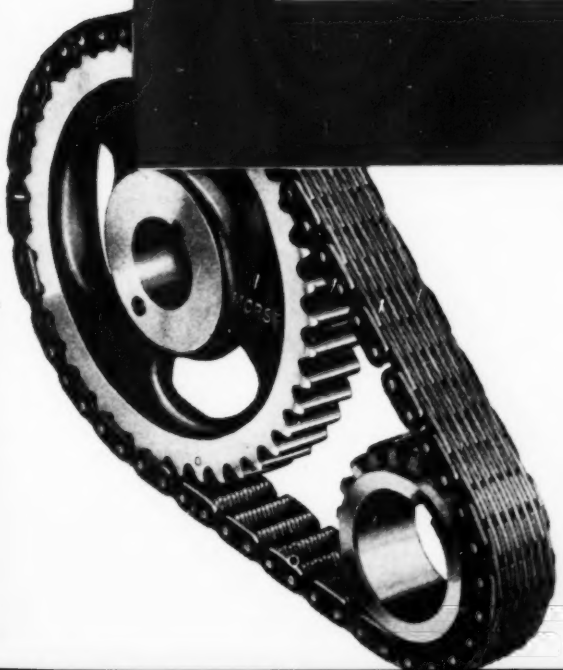
This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free, enlarged copy, suitable for framing for your collection.

What's behind the equation

M=TC

Morse *means* Timing Chains

for YOU



There's much. For example:

1. You get timing-chain drives of unmatched dependability, *proved* by the fact that eleven of the thirteen cars now using timing-chain drives use Morse Timing Chain Drives as original equipment.

2. You get—and can rely on—customer-conscious delivery that moves our chains and sprockets to you right on schedule.

3. You can take advantage of the specialized technical and engineering skills that have helped many manufacturers whip problems in timing-chain design, development, and application.

Call or write us for information on your timing-chain problems. We'll be glad to *show* you, in short order, why M=TC; Morse *means* Timing Chains—and what's behind that equation for you.

MORSE

BW

MORSE CHAIN COMPANY • Dept. 492 • 7601 Central Avenue • Detroit 10, Michigan

We Would like to "Hand it to You"...

This Complete Package of Metal-Working "Know-How"

Yes! Here is one of the nation's outstanding engineering departments ready to go to work for you!

Many of the country's more aggressive manufacturers now regularly specify metal-working equipment designed and developed by these engineers.

If your production equipment is slow, inefficient, old and expensive-to-operate, and you would like the finest in modern, high-speed, labor-saving machinery for leveling, processing, bending, forming, cold drawing, coiling, cutting, or feeding of **steel and non-ferrous metals**, put this top-flight, problem-solving crew to work for you now. Just call or write

McKAY MACHINE COMPANY, YOUNGSTOWN, OHIO.

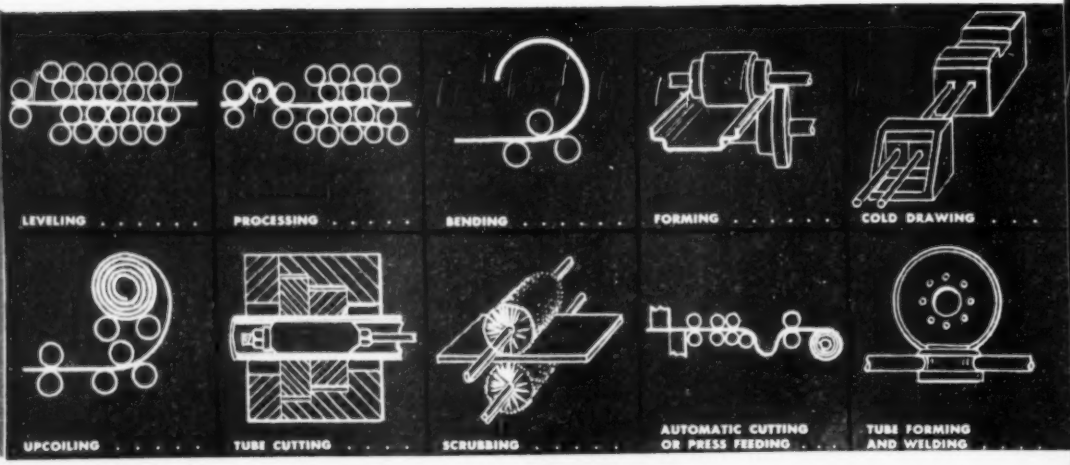
YOU CAN'T BEAT

McKAY-Built

METAL-WORKING MACHINERY

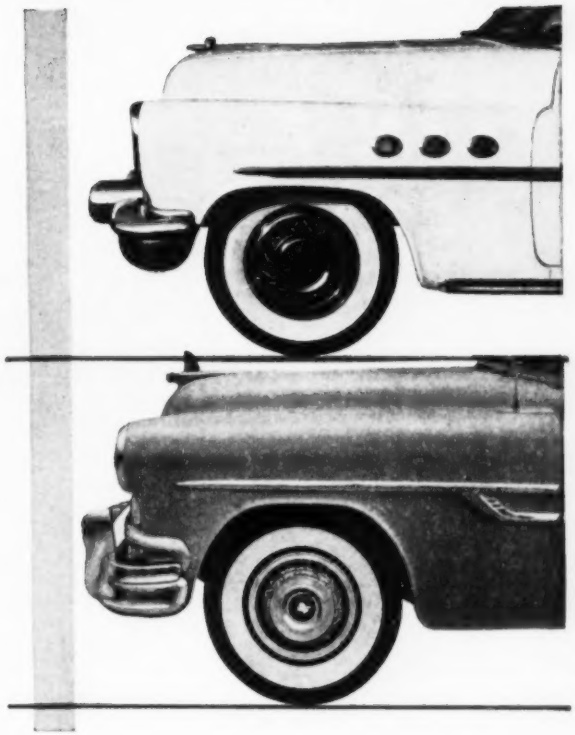
WHEN IT COMES TO . . .

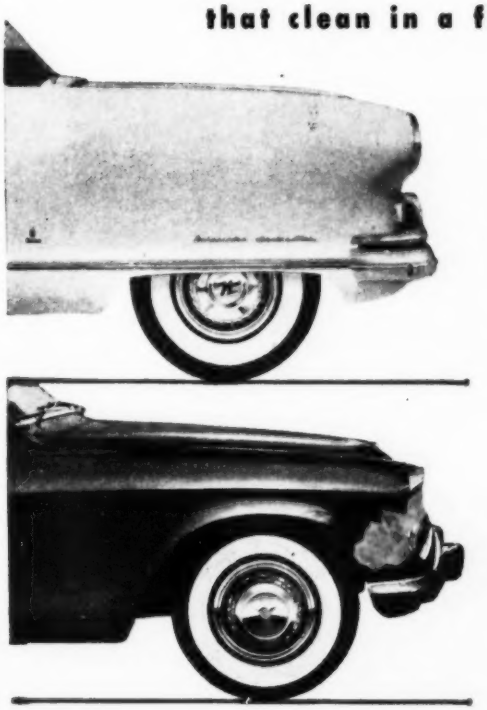
McK



Wire Wheel Covers

that clean in a flash!





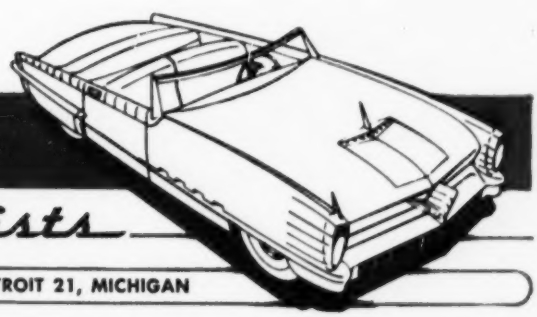
Wire wheel beauty has become one of the outstanding features of the sleek ultramodern American automobile.

A. S. Campbell Company, Inc. is currently manufacturing wire wheel covers as factory installed and accessory equipment on several of the country's leading automobiles. This wire wheel cover with its quality construction has been accepted as *the* standard in the automotive trade.

With Campbell wire wheel covers the old story of hard cleaning is at an end. Experience shows that the dabbing of the wheel surface with a soap sponge and rinsing of spokes with an ordinary garden hose cleans the entire cover in a flash.

Today, Campbell manufactures wire wheel covers as just one of many specially designed and engineered automotive items.

The creation of entirely new designs coupled with extensive manufacturing facilities for volume production enables the A. S. Campbell Company to work hand in hand with automobile manufacturers in producing functional and/or decorative automotive parts.



A. S. CAMPBELL CO. INC.

styling specialists

EAST BOSTON 28, MASS. • 10124 W. McNICHOLS ROAD, DETROIT 21, MICHIGAN

The new ALLEN BUTTON HEADS are here

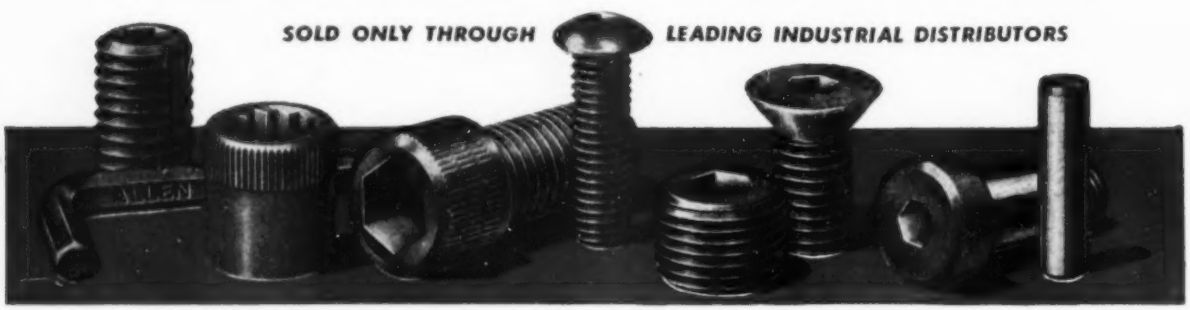
. . . and ALLEN ⬡ SOCKETS have the strength to make this new type practical

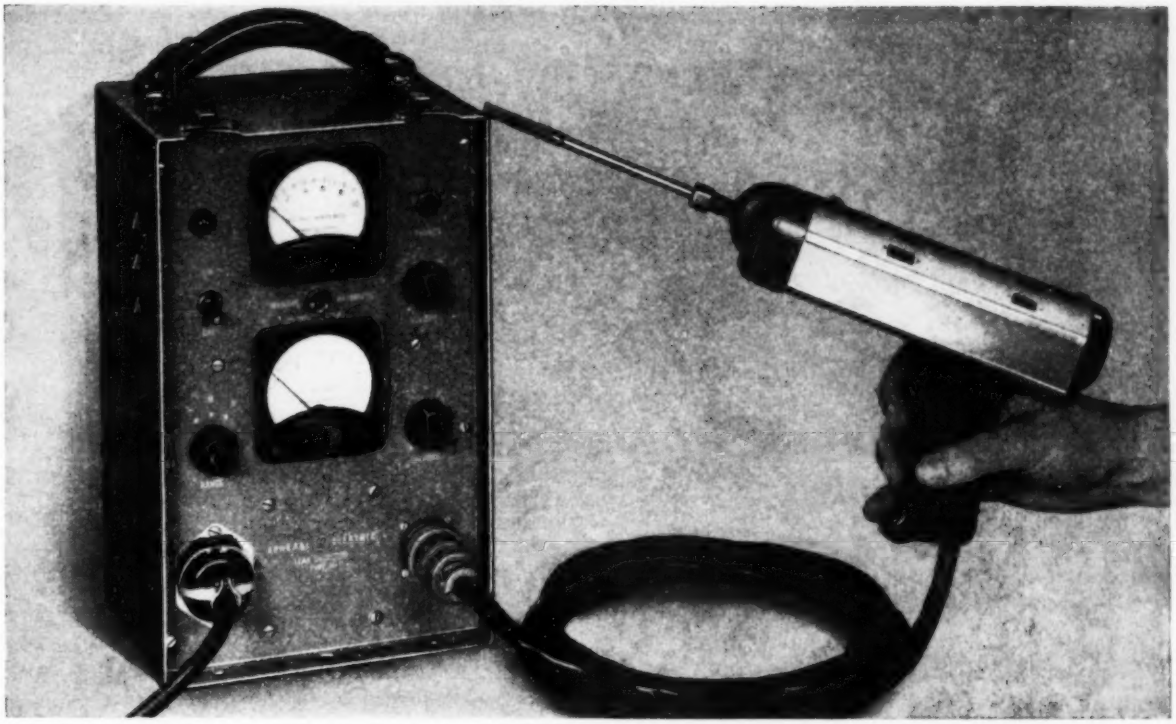
Button head cap screws provide smooth streamlined surfaces which are desirable in many applications that do not permit countersinking. However, their sockets are necessarily shallower than those of standard socket cap screws.

This makes it doubly important to be certain you specify genuine *Allen ⬡ Button Heads*. The basic superiority of Pressur-Forming and Allenoy steel provide ample socket strength for satisfactory use, even with the shallower socket.

Sizes from #8 x ¼" through ⅜" x 2" standard with NC threads. These sizes also standard with NF threads except in ½" and ⅜" diameters.

SOLD ONLY THROUGH LEADING INDUSTRIAL DISTRIBUTORS





GENERAL ELECTRIC TYPE H-1 LEAK DETECTOR IS SO SENSITIVE THAT IT WILL DETECT A LEAK OF 1/100 OUNCE OF "FREON"* A YEAR.

NEW AUTOMATIC FEATURES MAKE IT EASIER FOR YOU TO . . .

Locate Leaks Quickly with New G-E Leak Detector

WATER-COOLER COMPRESSOR leaks are easier to find with new G-E detector. New device features audible leak signal.

For easier locating of minute leaks through detection of a halogen-compound tracer gas, the new General Electric Type H-1 leak detector now offers:

AUDIBLE LEAK SIGNAL

The new G-E detector now indicates leaks not only by instruments on the control panel, but also audibly signals the presence of a leak by means of its new adjustable-volume loud speaker.

BACKGROUND GAS COMPENSATION

Slow changes in background concentrations of halogen gas can be automatically offset by a new rebalancing circuit. This circuit makes possible quick recovery of the instrument, but the sensitivity is somewhat reduced. A manual setting permits maximum sensitivity.

AUTOMATIC SUPPLY-VOLTAGE STABILIZATION

A built-in stabilizing transformer compensates for supply-voltage changes. Continuous constant-voltage operation is now assured.

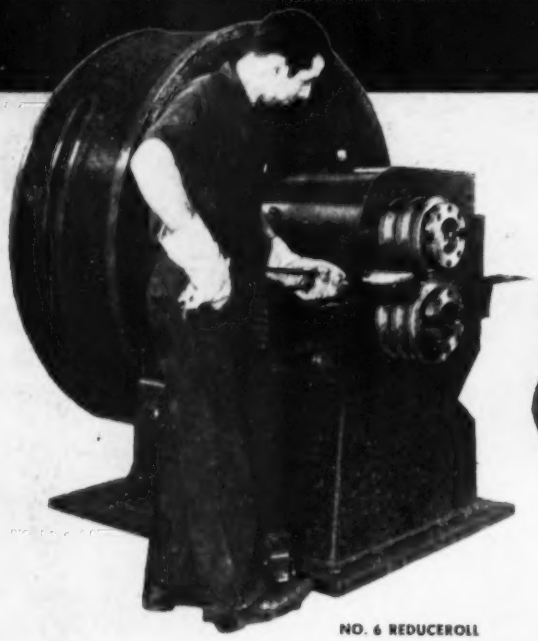
Complete unit costs only $604.50**. For further information, contact your nearest G-E Apparatus Sales Office, or write for Bulletin GEC-233 to: Section 605-42, General Electric Co., Schenectady 5, N. Y.

*Registered trade-mark, Kinetic Chemical Div. of E. I. du Pont de Nemours & Co.
**Manufacturer's suggested retail price.

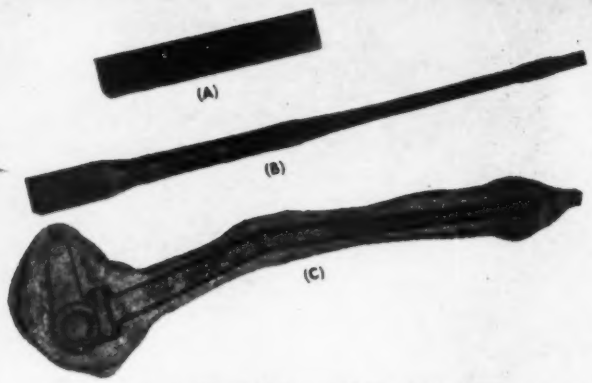
GENERAL ELECTRIC

SAVED BY REDUCEROLLING . . .

ONE MAN . . . ONE HEAT . . . ONE POUND of STEEL per FORGING!



NO. 6 REDUCEROLL



At Canada Foundries and Forgings Ltd., Welland, Ontario, the clutch pedal forging illustrated above, was *formerly* forged as follows: Stock was heated and upset in a 3" upsetter, then reheated and finish-forged in a 2500 lb. hammer. These operations required a crew of five men.

Now, by substituting a No. 6 REDUCEROLL for the upsetter, the blank is REDUCEROLLED and finish-forged on the same heat. This method requires only four men, and it saves one pound of steel per forging!

Stock (A) measures 1½ inches square by 9¾ inches long, weighs 6.24 lbs. REDUCEROLLED blank (B) ready for forging. Finished forging (C) forged on the original heat. Note small amount of flash.

REDUCEROLLING gives these advantages:

1. Increases production
2. Does not require skilled labor
3. Increases forging die life
4. Saves expensive material
5. Low-cost, quickly interchangeable rolls

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

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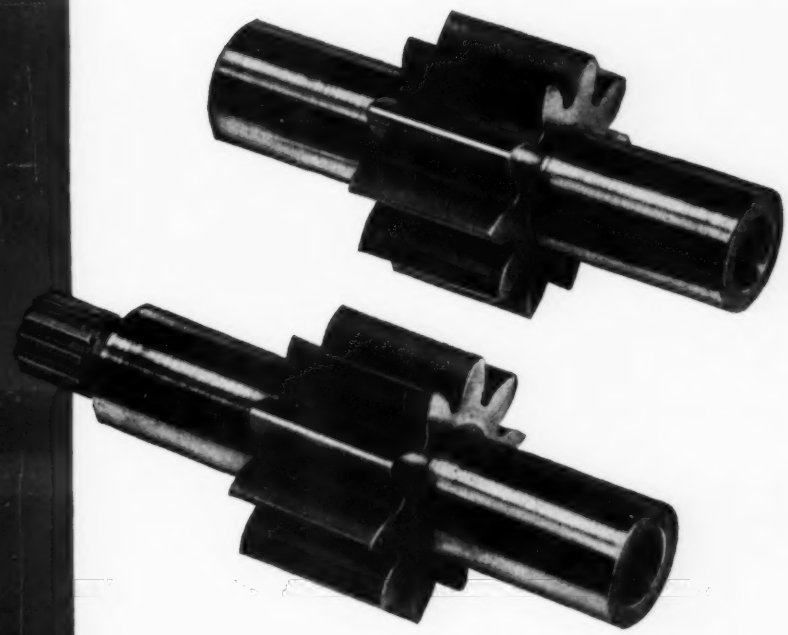

ONLY 2 MOVING PARTS

do the pumping in a Pesco Hydraulic Pump

This SIMPLICITY OF DESIGN is important for these reasons!

- ***reliability—less chance of pump malfunction***
- ***less maintenance***
- ***less cost for overhaul***
- ***less weight . . . less noise***

Add *Pesco Simplicity of Design* to Pesco's exclusive, patented "Pressure Loading" principle, which results in volumetric efficiencies up to 97% and torque efficiencies up to 90%, and you have two important reasons why so many industrial and aircraft manufacturers have standardized on Pesco pumps.

engineering Pesco production

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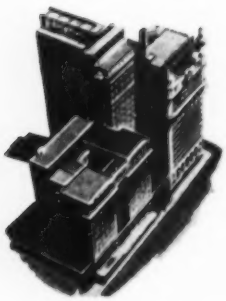
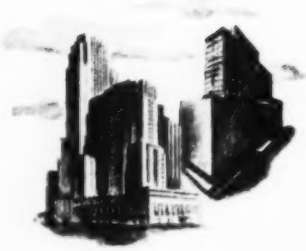


DALLAS
The Adolphus



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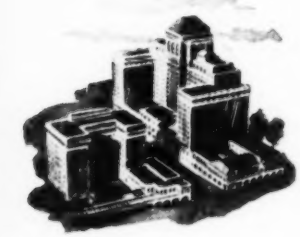

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CLEVELAND Four Point Press having a stroke of 40", bed area 102" x 204" and 600 tons capacity.

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So if you're out to step-up production and lower operating costs, then by all means, check Clevelands before you buy your next press! Let a Cleveland engineer show you why a Cleveland Press with a Cleveland (patented) Clutch is your outstanding press value. Write or call today!

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OSBORN

Osborn wire brush, automatically located, removes zinc chromate from around rivet holes in aircraft production.

Which of these versatile brushes will cut your costs?

Hard-to-get-at jobs are simplified . . . costly hand operations are eliminated . . . when you switch to one of these special-purpose Osborn power brushes.

These versatile wire brushes are just a few of the complete Osborn line of power brushes for every need. Your **O**sborn **B**rushing **A**nalyst will gather necessary facts in your plant . . . study your production equipment and recommend the most efficient, economical power brushing techniques.

The small Osborn brush shown in operation enables one man to do the work of seven men. Output per man went up 700% in this aircraft application of removing zinc chromate priming from around rivet holes in wings and fuselages. Formerly this job was done by hand with small sandpaper discs.

Such results are duplicated every day by **O**sborn **B**rushing **A**nalysts. They can solve *your* brushing problems of product cleaning, burr removal, roughing, polishing or finishing with similar startling economies. For complete information at no cost, call your nearby Osborn representative or write to *The Osborn Manufacturing Company, Dept. E-7, 5401 Hamilton Ave., Cleveland 14, Ohio.*

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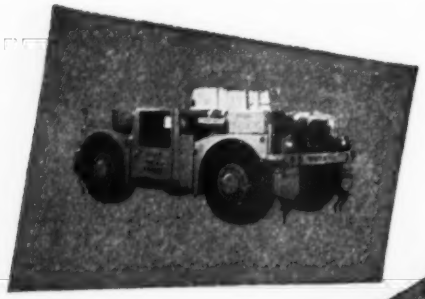

Janitrol

PUTS *heat* WHEREVER YOU WANT IT

Whenever a hot aircraft story breaks, chances are that Janitrol is in the picture. For one thing, Janitrol makes a complete line for commercial and military aircraft, ground vehicles and stationary engines. Janitrol portable heaters, now serving in scores of applications for engine warmup, shelter heating, etc., incorporate the same time-proven dependability of Janitrol aircraft heaters. And rounding out the line are Janitrol liquid heaters, whose performance on tow tugs, fire-fighting crash trucks, fuel trucks, and diesel transit coaches points to new applications on a wide range of diesel or gasoline engine powered equipment . . . Whether you build, operate, or maintain equipment that calls for heat, call in your nearest Janitrol representative. He's a good man to know.

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Today TEMCO has integrated these years of experience into a coordinated team, and is applying its multi-million hours of engineering know-how toward the design of turbine powered trainers and first line combat aircraft for our military services.

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"R B & W took us off a *hot spot* by cold-forging this key fitting"

● *"You know how important that little fitting is, Joe,"* continued Mr. Tobin. *"It connects the oil line to this filter we* make, and it was this component that gave us one headache after another."*

"How did you clear up the trouble?" Joe asked, as he peered at the oil filter he had seen on so many cars.

"Well, these spuds, as they are called, used to be machined from bar stock. If there were checks or seams in the bar, the machining process failed to detect them. Realizing that spot checking would not eliminate our difficulty, we were forced to magnetically inspect every single spud. This magnetic inspection threw production costs out of line on such a small item. It also showed us that a sizeable part of our production had to be rejected, thus indicating that a change of the production method was necessary.

"Then one of our men thought of RB&W and it wasn't long before their engineers came up with the idea of cold-forging this fitting. Cold-forging made the spud stronger and eliminated the danger of cracking and leaking. It also made the fitting easier to weld to the filter. As a bonus, they even did away with one of the machining operations by forging a countersink at the same time they forged the fitting. Now we're getting better spuds at lower cost in less time — and we no longer need the magnetic inspection."

Maybe this sounds like a special case to you, but it puts in sharp focus RB&W's down-to-earth engineering skill, as well as our practical experience in designing and fabricating the kind of fasteners that can solve your assembly problems.

Most of your fastener requirements can be met with standard products from our stock. However, if the unusual is called for, we'll design and make it for you—as efficiently and quickly as we turned out a better spud for this filter manufacturer.

Remember—for any fastening job, it's a smart move to call in RB&W. You can count on RB&W bolts, nuts, screws, and rivets for uniform accuracy, dependability and physical properties. And you can also count on fast service from RB&W's strategically located plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Pittsburgh, Detroit, Chicago, Dallas, San Francisco. Sales agents at: Portland, Seattle. Distributors from coast to coast.

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

*Fram Corporation, East Providence, R. I.

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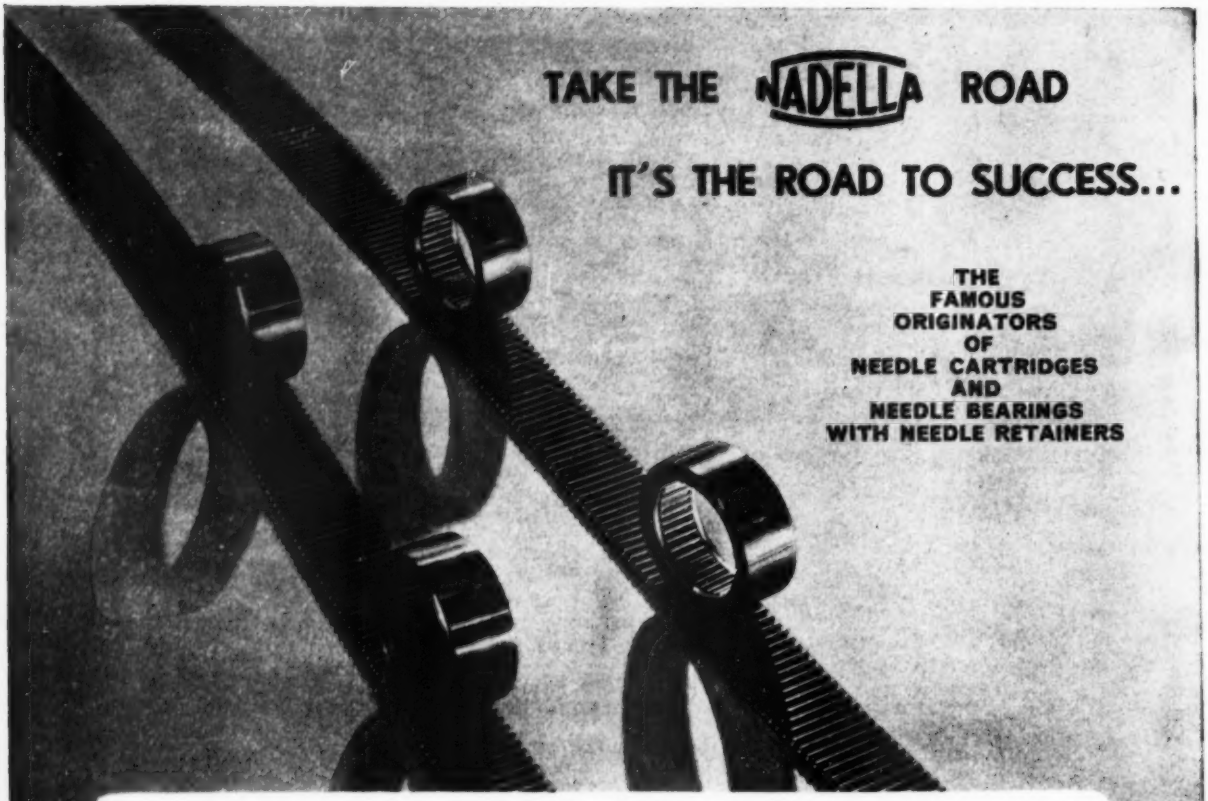

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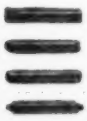
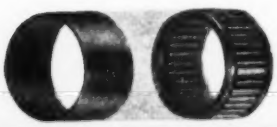
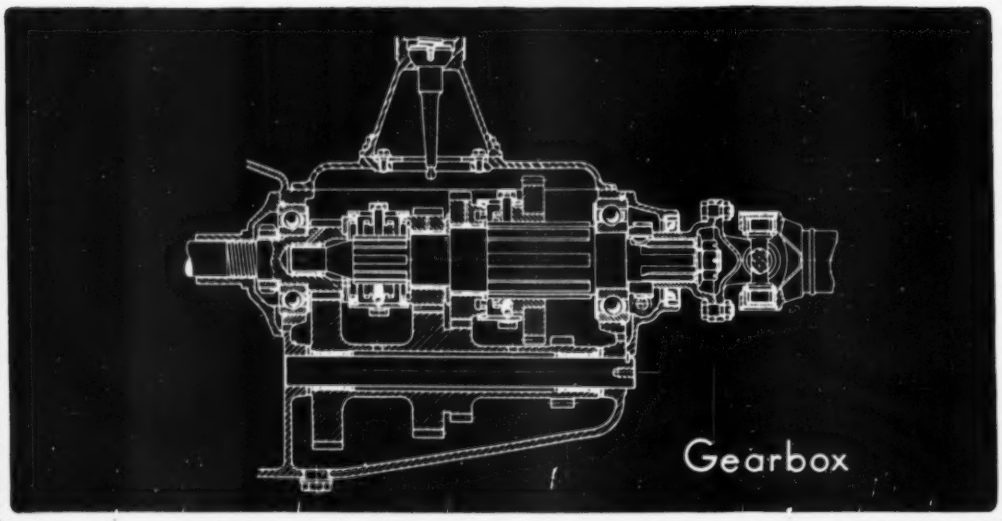


needle cartridges



complete bearings



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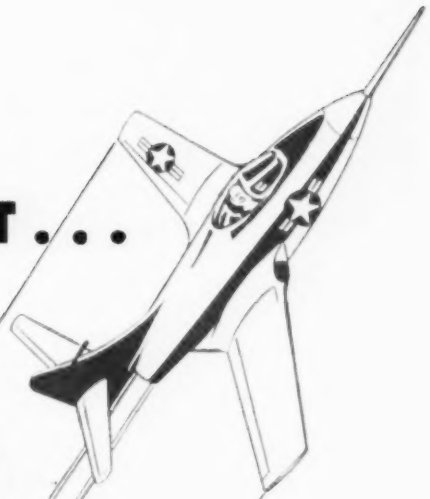

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Over twenty aircraft sizes for every material from aluminum to nickel alloy steel, for every speed from 550 to 15,000 rpm, for every capacity from 5/32" to ½".

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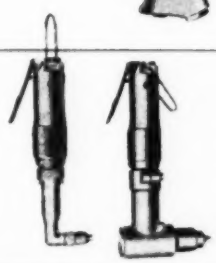
For speeding up nut running, with no kick or twist to the operator. Five aircraft sizes available in capacities from a #10 screw to ⅜" bolt size.



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Over thirty aircraft sizes to solve even your trickiest drilling problems. Six types of angle heads, speeds from 365 to 3000 rpm, capacities from 5/32" to ½"

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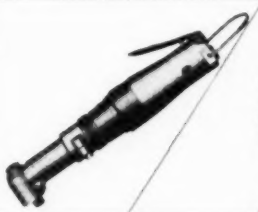
Three aircraft sizes for small mounted wheels, rotary files, and up to 2" diameter wheels. These tools are rigidly constructed for heavy duty operation, but are light-in-weight for precision work.



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Over thirty aircraft sizes of Angle and Straight Nut Runners for precise torque control for jobs from a #10 screw to ½" bolt size.

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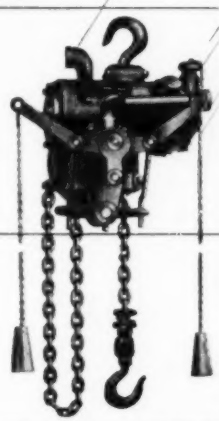
Thirty-eight aircraft sizes and two styles of handles for rapid screw driving to accurate torque requirements. Capacities from #8 to 5/16" diameter screws. Complete list of bits available.



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Over thirty-five sizes for loads from 200 to 20,000 lbs. Complete speed control from a smooth crawl to full speed. Two types available, overhead for lifting, and utility for hauling or hoisting.

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Specifically designed for aircraft riveting to meet high standards and tight production schedules. Six sizes to handle all your riveting jobs from 3/32" to ½" diameter rivets. Each size available with 3 styles of handles.

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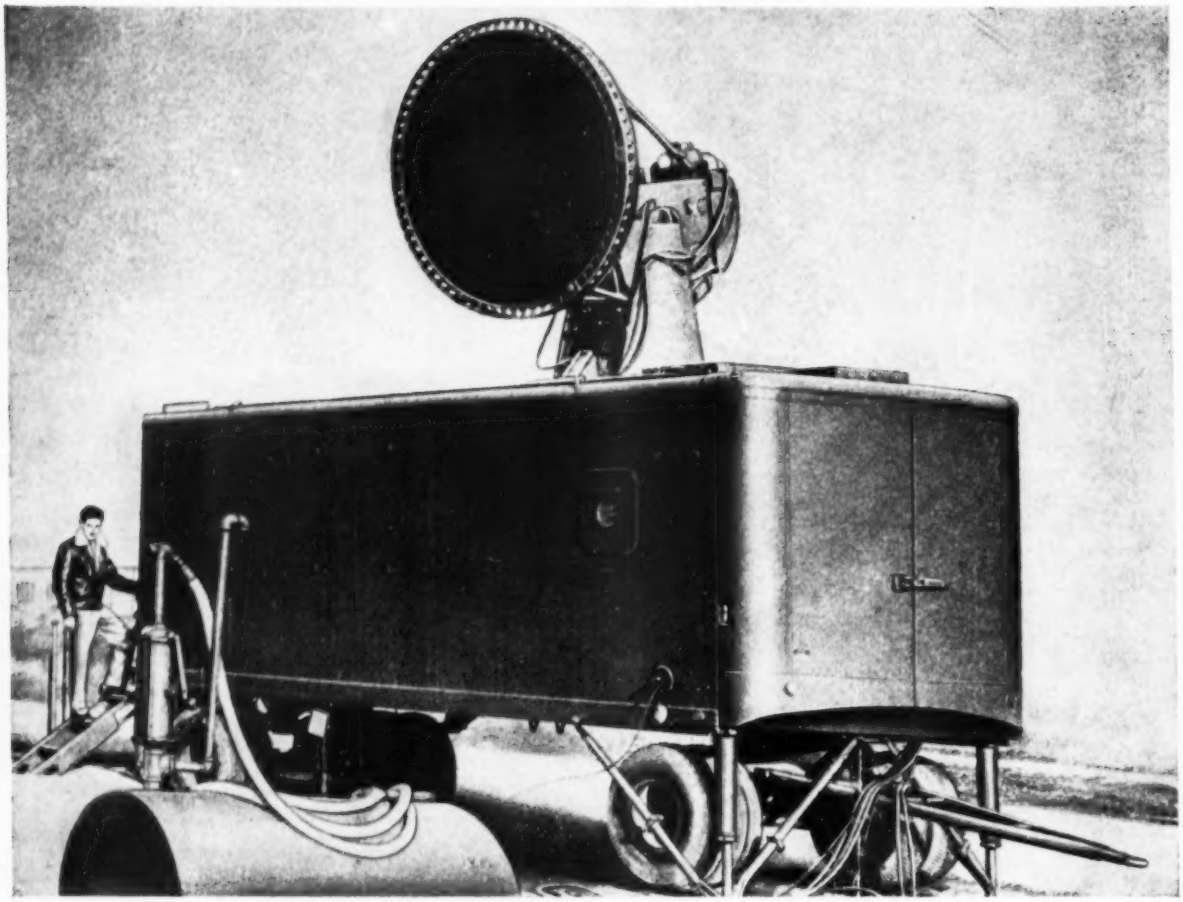

It takes PRECISION MANUFACTURING to say "HERE THEY COME"

The big, round screen on top of the mobile trailer, is a radar antenna—part of a new fire-control system for anti-aircraft gun batteries.

Details are classified for security reasons. However, many improvements and refinements, make the device more informative, effective and flexible than its predecessors.

We make the radar antenna and the intricate, precision gears that actuate the system, for the Western Electric Company. Gears that must be precise, because gear errors of ten-thousandths of an inch, mean miles in the sky.

Ours is a record of 37 years of precision design, engineering development and production. Today, 90% of our defense work is in aircraft and ordnance contracts. We help work the miracles of exactness which strengthen the defenses and protect the security of America.

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Write our Redwood City office for reprints of this Logbook page

Sealing News & Tips

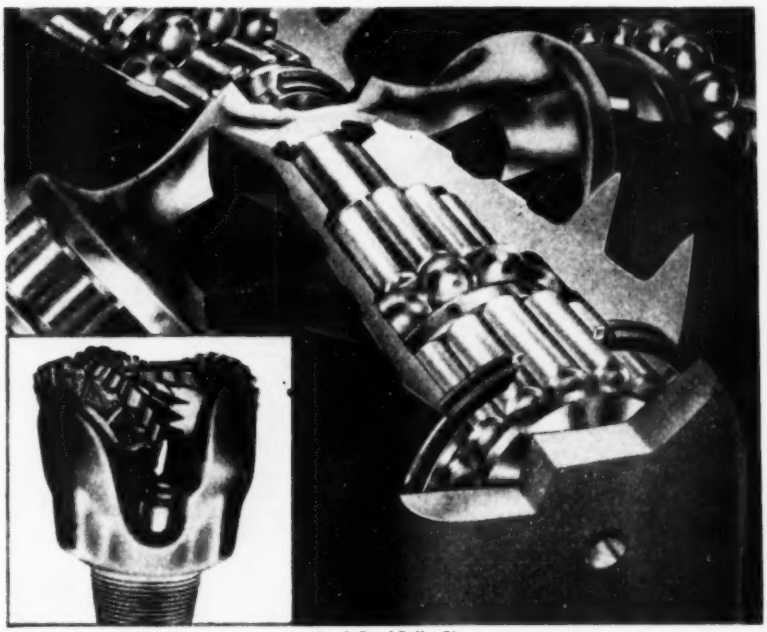

Fig. 1. Reed Roller Bit

National Syntech* Oil Seals lengthen life, improve performance of Reed roller bits

The conditions under which rotary rock bits operate are extremely severe. To lengthen bit life, improve performance and limit admission of abrasive materials from cutter bores, Reed Roller Bit Company utilizes National Oil Seals in their heavy-duty rock bits.

Three National seals—two standard design 360,000 series and one special design face seal—are installed in each bit. These seals are of springless design with precision-trimmed sealing lips of National Syntech synthetic rubber (Figure 2). The inherent "flex" action of the Syntech lip insures satisfactory sealing despite runout and the heavy impacts of rock drilling. The Reed Company reports that "Bits containing seals are in noticeably better condition than bits not containing seals—both being run under the same conditions and for the same length of time."

The National Oil Seals in this application illustrate but two of thousands of National designs. Perhaps your product can benefit by utilizing standard design National seals; perhaps special seals are required. In either case, our long experience with sealing problems is at your disposal.

Fig. 2. (L) 360,000 series Syntech (R) 6543 Syntech

*T.M. Reg.

National 350,000 series with flange case

To simplify installation, many users specify National Oil Seals with flanges. Illustration shows a standard design National 350,000 series Syntech* Oil Seal with bolt-on flange. This spring-tensioned design with synthetic rubber sealing lip is often specified in applications involving high speeds and high temperatures.

National 50,000 series, modified

A standard design National seal, modified, with special flange. O.D. of flange press fits into housing. National 50,000 series leather seals such as this (with and without flange) are ideal for heavy-duty applications where seals may run semi-starved and external dirt or dust conditions are severe.

National O-Ring Catalog

National, a world leader in oil seals, now offers a complete line of standard size commercial grade O-Rings. See the nearest National Applications Engineer for complete details or write direct for new National O-Ring catalog.

"Let Your Decision be Based on Precision"

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OIL & GREASE SEALS
O-RINGS SHIMS

NATIONAL MOTOR BEARING CO., INC.
General Offices: Redwood City, California
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DOWNEY (LOS ANGELES CO.), CALIF. . *11634 Patten Rd., TOpaz 2-8166*
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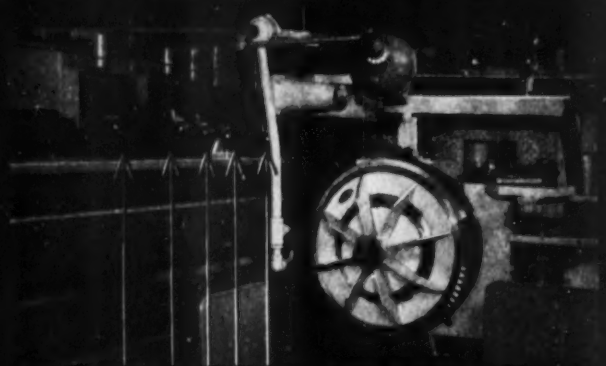
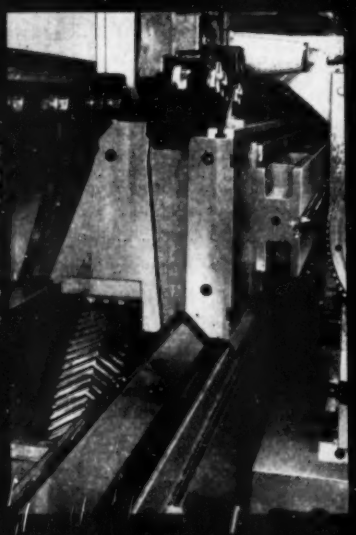
LAPOINTE offers



LIMIT SWITCHES for operating DUAL SPEED and DUAL CYCLE (Patented*)

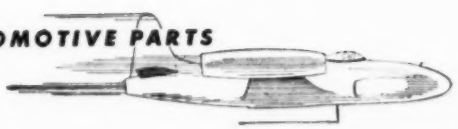
The Dual Speed feature permits the machine to be operated at two predetermined speeds for the same broaching stroke. Dual Cycle is the exclusive LAPOINTE feature that has been developed for successful broaching of jet engine components without requiring tool changeovers for the accuracy required.

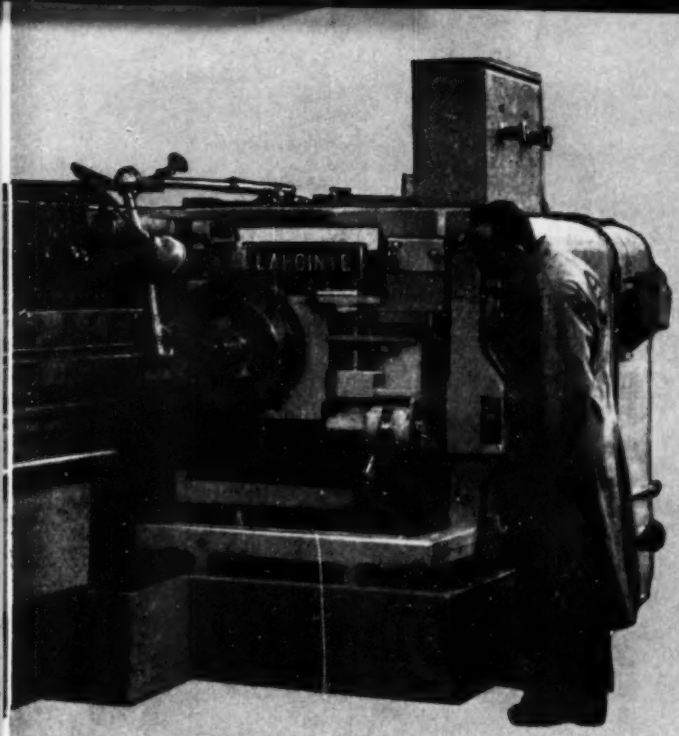
Two of the reasons for the smooth, positive functioning of this new LAPOINTE Broaching Machine are seen in this picture showing the large diameter continuous-tooth herringbone gear and rack, and the guiding of the massive main slide.



*No. 2,617,333

FASTER BROACHING OF JET ENGINE PARTS AND AUTOMOTIVE PARTS





LAPOINTE 30/180" SRHE, broaching Turbine Wheel J57.

The electro-mechanical drive accounts for the remarkable versatility and flexibility of this newly developed single ram horizontal broaching machine. Note that the cutters are at eye level.

new ELECTRO-MECHANICAL DRIVE horizontal BROACHING MACHINE

for SURFACE BROACHING at speeds up to 300 fpm!

Now, for the first time, there is practically unlimited opportunity to make tests to determine the best broaching speed for any particular metal! Once the proper speed is found, this new LAPOINTE Broaching Machine will give

- **substantially increased production**
- **better finish and**
- **greater accuracy through freer cutting action.**

Carbide-tooth broaches and HSS broaches both perform exceptionally well on this machine, which is fully described in a new bulletin available on request. Ask for *Bulletin SRHE-10.*

Another striking example of Lapointe engineering leadership, with everything designed and built at one source . . . no divided responsibility!

Industry looks to Lapointe for the latest developments in broaching machines, tools, and fixtures.

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Have you investigated

"BORON STEELS"

as a ready means to increased hardenability?

Farm equipment and earth-moving machinery manufacturers are using boron steels for axles, spindles, drive gears and many other heavy section parts.

Boron steels—used for pinions, shafts and heavy-duty gears for air-cooled engines—are helping to meet new requirements in the aircraft industry.

In gears, pinions, axles, springs and many other automotive parts, older grades of alloy steels are now being replaced by boron steels.

Boron steels are enabling manufacturers of hand tools and shop equipment to make significant cuts in their annealing costs.

Millions of tons of boron steels made with Vancoram GRAINAL Alloys are now in service.

These steels are doing many of the jobs formerly done only by the older grades of higher alloy steels. They contain, however, far smaller amounts of critical alloying elements—because GRAINAL Alloys replace these elements with respect to hardenability.

If you are having trouble getting steels with the hardenability you require, investigate boron steels today.

Ask your steel supplier for complete information.

VANADIUM CORPORATION OF AMERICA

420 Lexington Avenue, New York 17, N. Y.

DETROIT • CHICAGO • CLEVELAND • PITTSBURGH

VANCORAM

Producers of alloys, metals and chemicals

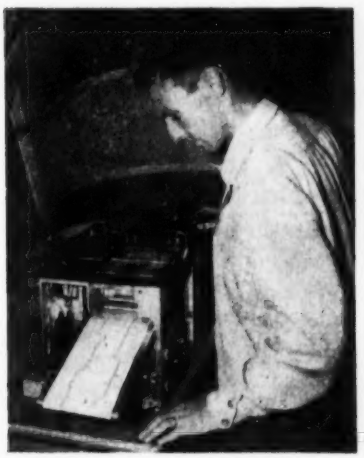
SANBORN OSCILLOGRAPH RECORDING SYSTEMS HAVE MANY APPLICATIONS

Sanborn Recorders Help Speed Flight Design

SPERRY GYROSCOPE COMPANY uses a two-channel Sanborn Recording System for basic research on their Zero Reader* Flight Director, a device which simplifies the manual control of aircraft. The Sanborn System shown above is recording the output of a flight simulator that solves Zero Reader equations.

*T. M. REG. U. S. PAT. OFF.

At McDONNELL AIRCRAFT CORPORATION the movements of a guided missile are simulated by high-precision analog computers which in turn send *eight* different resultant electric signals into two Sanborn four-channel Recording Systems (left) for the graphic recording of the hypothetical results of the guided missile problem.



At DOUGLAS AIRCRAFT COMPANY'S Flight Test Section, a Sanborn two-channel Recording System (shown removed from case for field operation) is used in conjunction with a telemeter radio link to record surface motion vibration in a flying aircraft while it is performing tests requiring continual monitoring. Recorded tracings provide the necessary permanent visual time history for comparison of the two events recorded and a study of their individual characteristics.

How can Sanborn help you?

Sanborn one-, two-, and four-channel Recording Systems can provide an accurate and permanent graphic registration of almost any electrical phenomena whose frequency spectrum falls within the range of zero to 100 cycles per second. The availability and ready *interchangeability* of amplifiers and preamplifiers offer a wide range of use.

Records are traced by heated stylus on plastic coated strip-chart paper, and are in true rectangular coordinates. Other Sanborn advantages include: a high torque movement (200,000 dyne cms per cm deflection); built-in code and time markers; and a wide choice of paper speeds and channels.

Sanborn engineers will be pleased to make recommendations as to what type of equipment will best solve your recording problem. When writing, include the lower and upper limits and the frequency range of the phenomena to be recorded, and the type of transducer.

Ask for a copy of our "Applicability Folder" which presents a table of uses, complete performance data and specifications, brief descriptions of Sanborn Recording Systems and explanations of how their amplifiers may be readily interchanged.

SANBORN CO. INDUSTRIAL DIVISION
CAMBRIDGE 39, MASSACHUSETTS

Operator reports:

One of 3 Euclid twin-engine scrapers. Twin application is made possible by Allison TORQMATIC DRIVES.

25,900 trouble-free hours!

BACK in July 1950, the George M. Brewster Company, Inc., put to work three 18-yard scrapers equipped with Allison TORQMATIC DRIVES. At the same time, this New Jersey contractor converted four 13-yard bottom-dump trucks from mechanical drives to TORQMATIC DRIVES.

And to date these seven units have piled up 25,900 trouble-free hours—a record far surpassing experience with mechanical drives. This high-availability record has paid big dividends by lowering operating costs. Performance records like this tell why many operators are now insisting on Allison TORQMATIC DRIVES in their new equipment. If you are not familiar with all the advantages of these drives, get the full details from your equipment manufacturer or dealer or write to:

ALLISON *Division of* GENERAL MOTORS
Box 894AA, Indianapolis 6, Indiana

ALLISON TORQMATIC DRIVES

Unbeatable Team for Maximum Operating Economy

- ✲ *Quick-shifts* at full throttle with fingertip hydraulic control.
- ✲ *Holds* power to load at all times—no clutch pedal to push—no gearshift guess.
- ✲ *Cuts* maintenance cost by absorbing shock—eliminates engine lugging—prolongs equipment life.
- ✲ *Only* torque converter-transmission team designed to work as a unit and built by one manufacturer.

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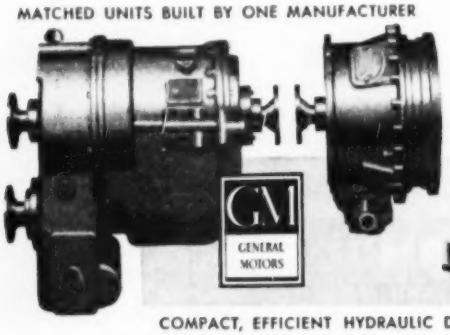

Allison TORQMATIC DRIVES

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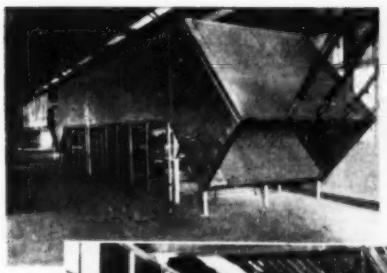
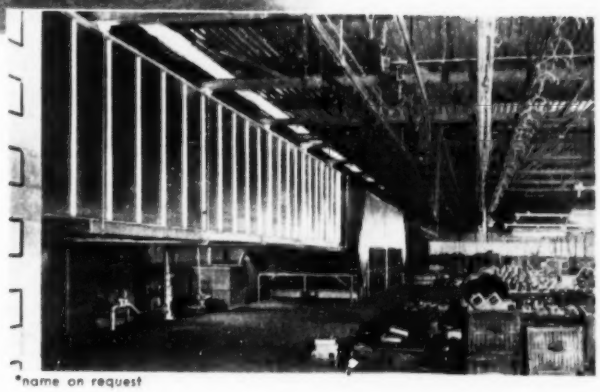


*TOY MANUFACTURER REACHES NEW PRODUCTION HIGH with BURDETT 4-Conveyor "Radiant Heat" System



*name on request

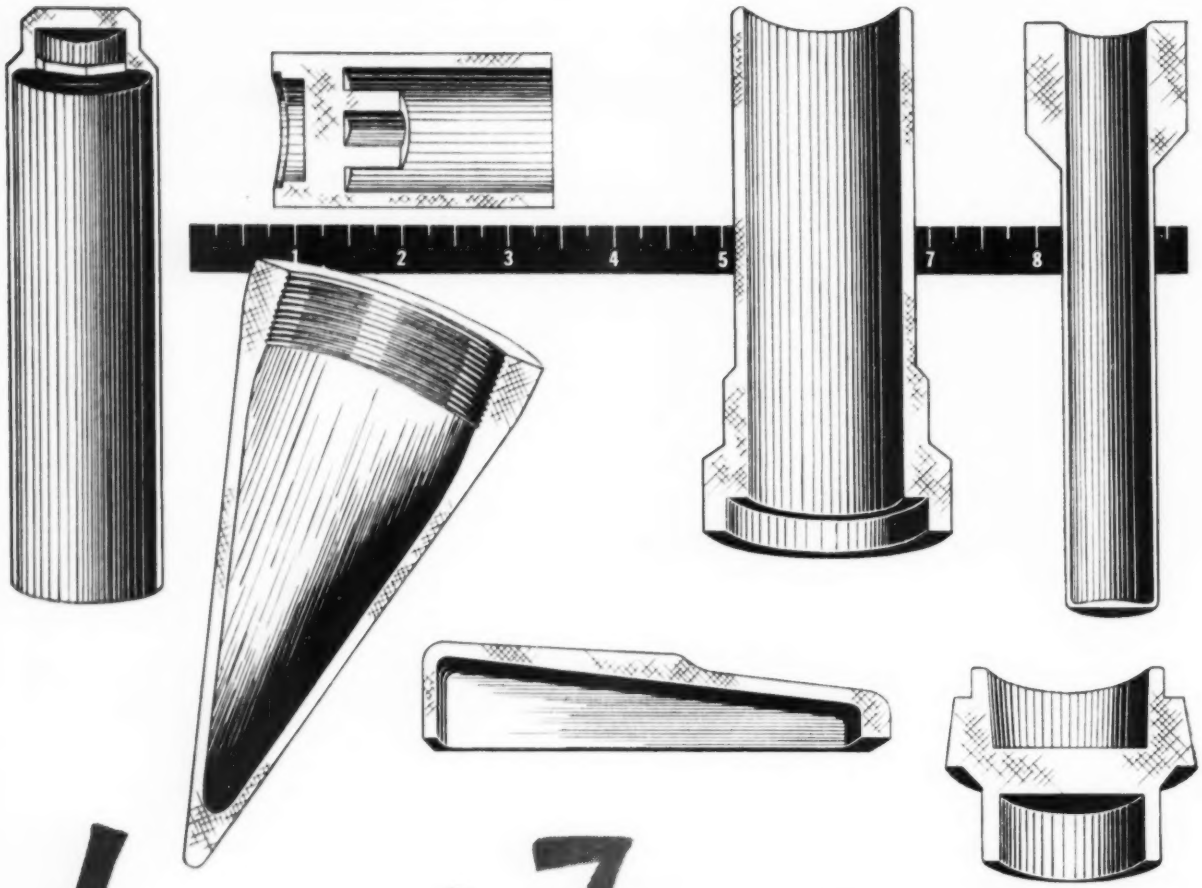
In this toy plant installation, Burdett has combined the long proved, and even revolutionary, results of its famous "Radiant Heat" with a 4-conveyor method of handling painted toys. Why shouldn't production reach a new high with dip-painting of 4 colors and simultaneous drying of these colors on 4 continuous conveyors. Satisfactory drying of any combination of colors, simultaneously, is one of Burdett's most sought advantages. In this installation, the drying cycle is only 5 minutes at 350° F., with a net production of 17,000 units per day. Another feature here is a water flooded section into which excess paint drips to be carried away to a settling tank from which the water is recirculated. Many combinations of specially engineered material handling methods can be combined with Burdett's famous drying features. There is no obligation for recommendations—tell us your problems and know you can meet competition with a price advantage.

BURDETT

MANUFACTURING COMPANY

3427 West Madison Street Chicago 24, Illinois

Also Manufacturers of "Radiant Heat" Systems, Ovens, Heaters, Air Make-Up Units, Spray Booths and Washers.



Impact Forging

produced these parts in *seconds* — from HIGH STRENGTH ALUMINUM ALLOYS

Impact forging high strength aluminum alloys is a new production technique perfected by the Research and Development Department of Hunter Douglas. This new process produces parts with excellent tolerances, surface finish, and superior physical properties. In many cases production machining can be eliminated entirely; in every case machining is held to an absolute minimum. High strength parts of such alloys as 14ST6 ready for final assembly have been delivered at prices less than the cost of the bar stock alone when using ordinary methods.

Millions of impact forgings produced to date at low unit cost has proven the adaptability of impact forging to mass production requirements.

If you are now designing or producing a part requiring the properties of a forging, walls of zero draft, and close dimensional tolerances, let the Hunter Douglas engineering staff show you how you may reduce unit cost with aluminum impact forgings. Your blueprints, specifications, or sample parts will receive prompt analysis.

HUNTER DOUGLAS *CORPORATION*

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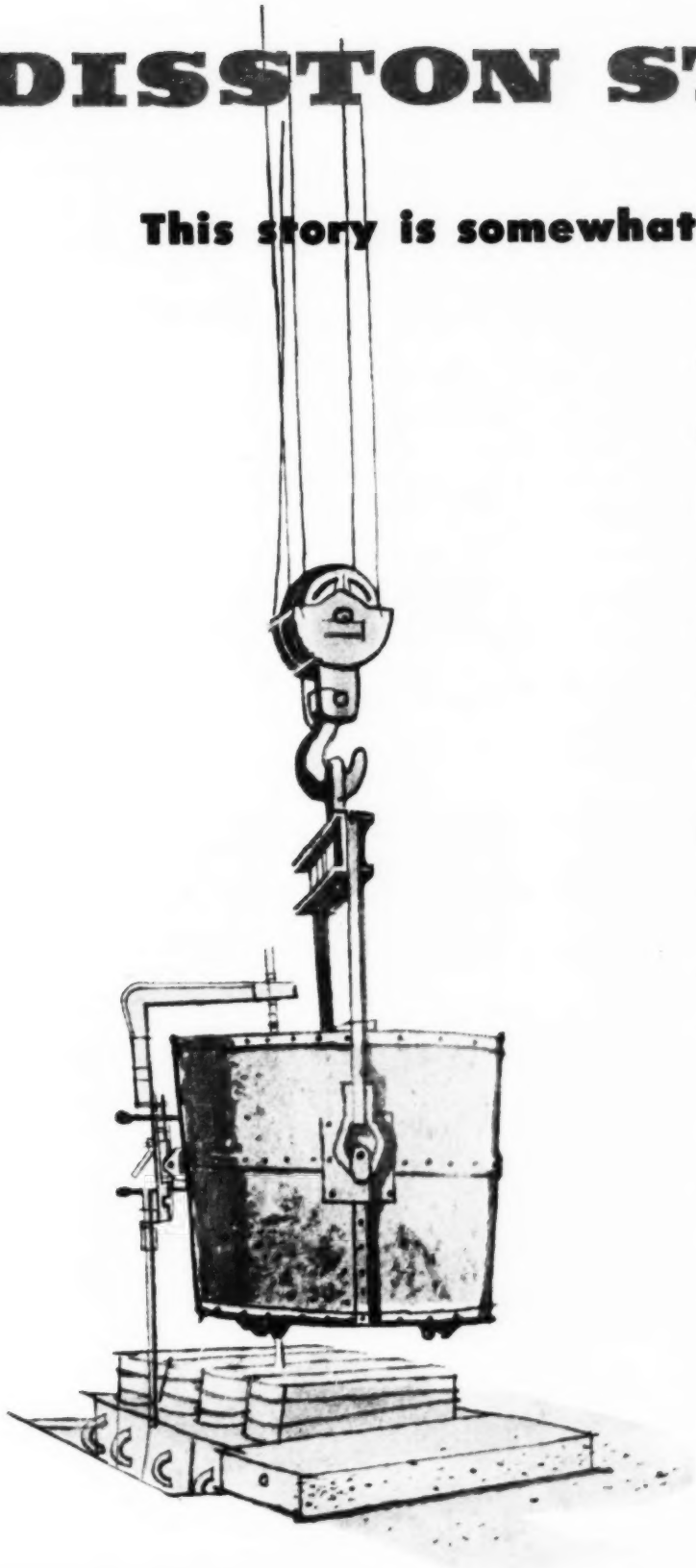
DISSTON STEELS

This story is somewhat different



. . . for Disston is both a steelmaker *and* a toolmaker. In its extensive mills the company produces many kinds of high-grade special steels — for use by other leading toolmakers, as well as for its own famous saws and tools. Throughout industry, the phrase "Made from Disston Steel" is recognized as a guide to the very highest quality.

Hot rolled, carbon, and alloy steels—including water-, oil-, and air-hardening die steels, and high speed steels. Special shapes and composite steels.

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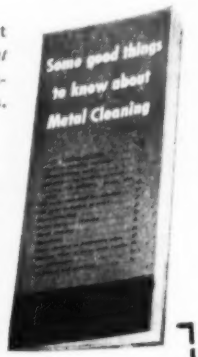
During the past year, the Oakite Chemical Research Laboratory has produced 16 new materials for performing the following metal cleaning and processing operations:

1 **Heavy-duty cleaning in tanks**
2 **Etch-cleaning aluminum**
3 **Washing in pressure-spray machines**
4 **Electrocleaning zinc-base die castings**
5 **Putting heavy zinc phosphate coatings on steel in preparation for painting**
6 **One-operation cleaning, pickling and conditioning for painting**
7 **Stripping paint**
8 **"Killing" paint in spray booth wash water**
9 **Drawing and forming**

One of these new materials may be the right answer for some problem that's been giving you a lot of trouble. Just circle the job number in the coupon, and let us tell you about the new chemical designed for the work.

FREE Our 44-page illustrated booklet "*Some good things to know about Metal Cleaning*" has been revised to discuss the application of the 16 new materials.



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Send me a FREE copy of "*Some good things to know about Metal Cleaning.*" Also, give me more information about new Oakite materials for the jobs listed in your advertisement, as indicated by the numbers circled below:

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6 7 8 9

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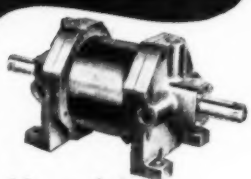

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- ★ Centrifugally Cast Cylinder Bodies
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- ★ Leakproof Packing. "O" Rings in each end cap
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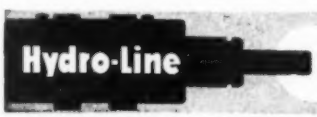
HYDRO-LINE CYLINDERS CONFORM TO J. I. C. STANDARDS

➡ ***FREE Additional Data***

covering additional construction and performance features are included in this catalog. Write for your copy today. Ask for bulletin 350.



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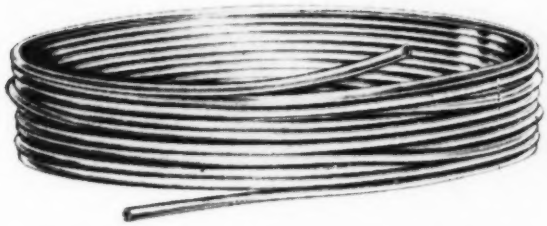

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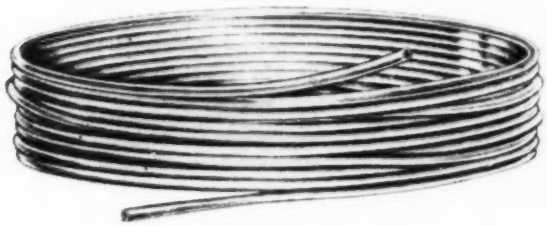
LUBRICATING OIL LINES • GREASE LINES



ALCOA UTILITUBE, the all-purpose aluminum coiled tube, offers you savings up to 40 per cent over other corrosion-resistant metals. It is ideal for carrying air for instrument and brake lines—gasoline and fuel for internal combustion engines—lubricating oil for engines and machines—fluids for hydraulic systems.

Alcoa Utilitube bends more easily than annealed copper . . . work hardens less . . . has excellent forming and flaring characteristics. It will not cause sludge or gum formations. It will not discolor or contaminate the fluid it carries. It safely resists corrosion by hundreds of hard-to-handle compounds and industrial atmospheres. In extremely low temperatures, mechanical properties actually improve.

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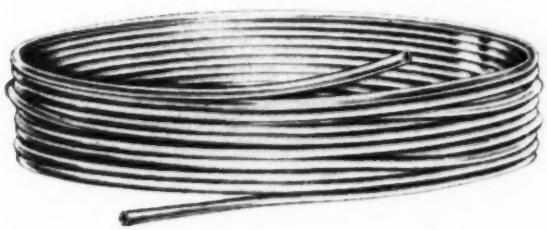

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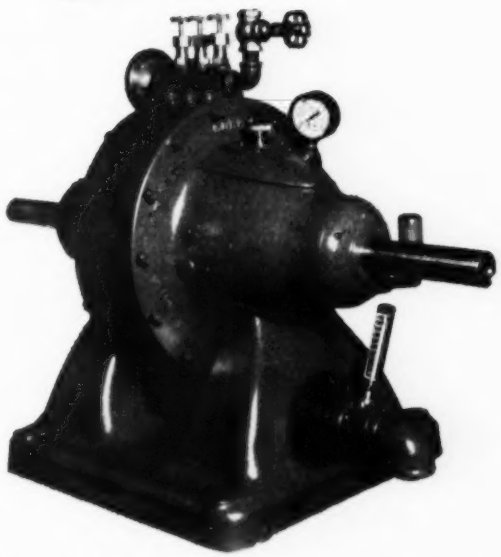

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- Metal Spray Guns . . . or Wherever the line must deliver clean, dry air or gas

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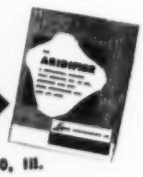

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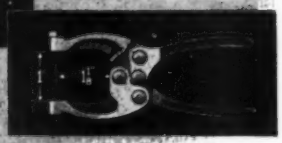

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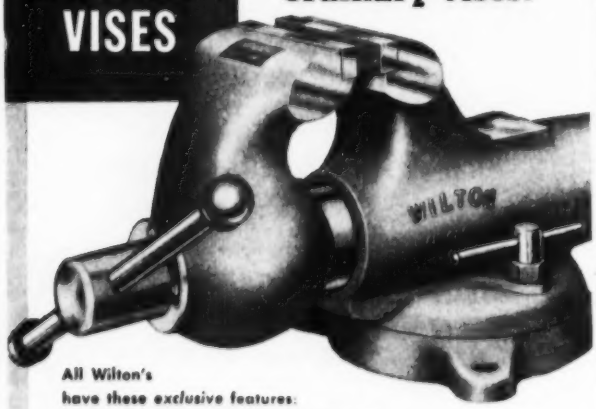
costs no more than ordinary vises!



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- **Straight line pull for greater strength.**
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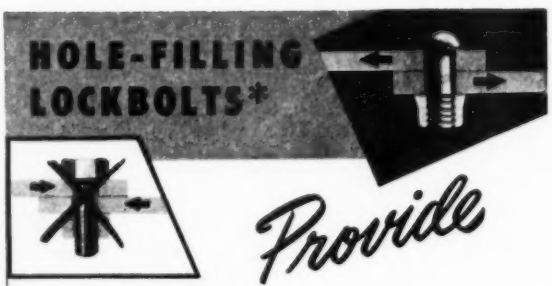

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Huck Lockbolts assure an interference fit when driven in ordinary drilled holes that are as much as seven thousandths of an inch smaller in diameter than the Lockbolt shank. Hole-filling qualities plus the automatic driving and uniform tightness of Lockbolts eliminate joint deflection while increasing joint rigidity and resistance to shear fatigue. These same features provide Lockbolt joints with air- and water-tight characteristics that are mandatory for many applications.

Form No. 8212

**Manufactured under U.S. patents, other patents pending.*

Huck MANUFACTURING COMPANY
2480 BELLEVUE AVENUE
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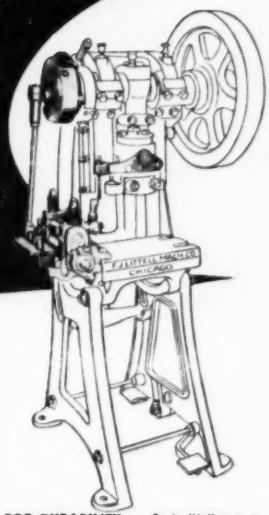
FOR LOW COST
AND BIG RESULTS
Feed Your Presses With

LITTELL

STYLE "M" AUTOMATIC

ROLL FEED



FOR SPEED . . . With Style "M" automatic feeding your press can easily produce 9,000 stampings an hour at 200 strokes per minute, or 4,600 stampings an hour at 100 strokes per minute.

FOR VERSATILITY . . . Style "M" feeds left to right, right to left and front to back. Feed direction can be reversed by simply reversing clutch. Feed lengths per stroke are 0 to 4⅜" with standard gears and 0 to 8½" with compound gears.

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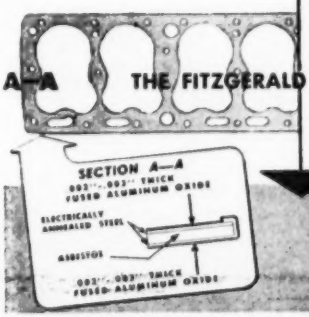

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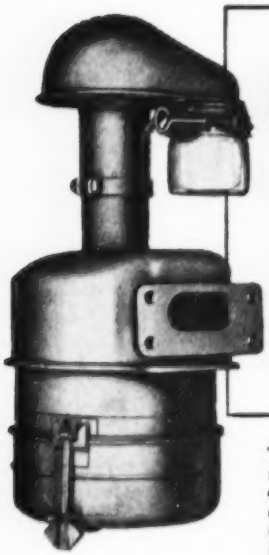

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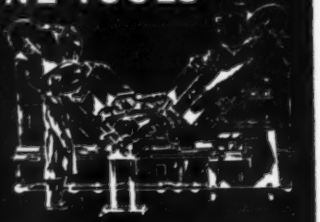

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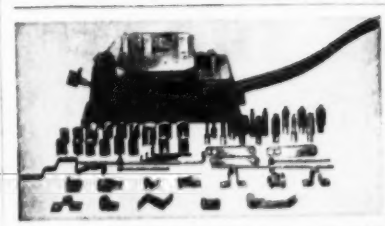

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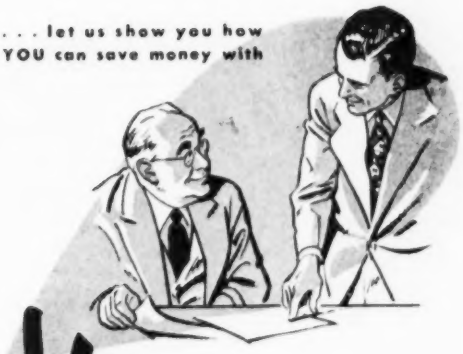

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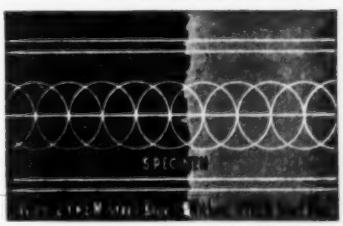

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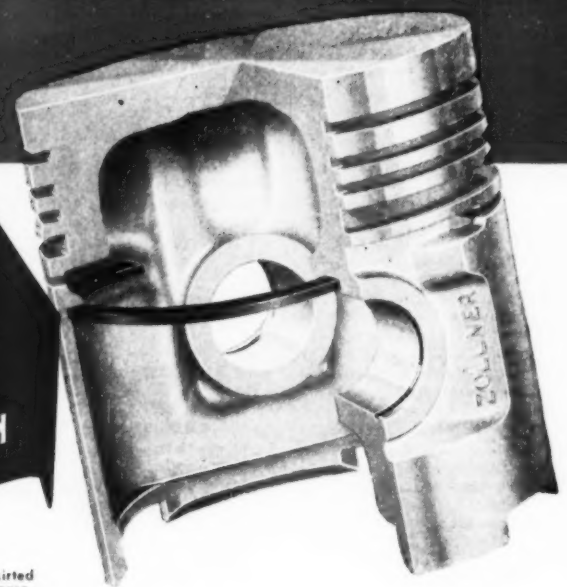

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3rd - SAM HANKS

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WRITE FOR LATEST CATALOG AND PRICES

"EVERLOCK" IS A REGISTERED TRADE MARK OF THOMPSON-BREMER & CO.

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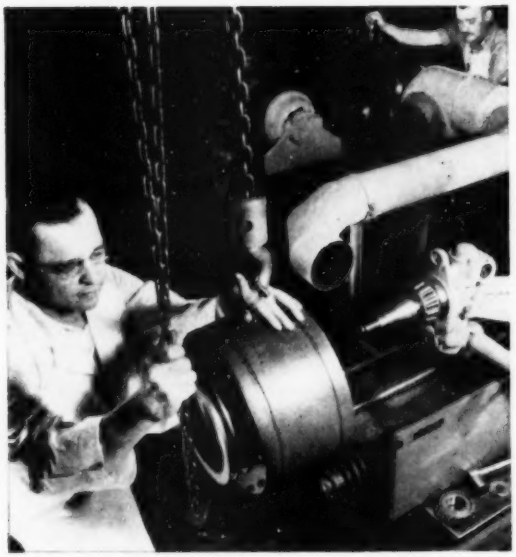
SUBSIDIARY OF AMERICAN MACHINE AND FOUNDRY COMPANY • NEW YORK, N. Y.

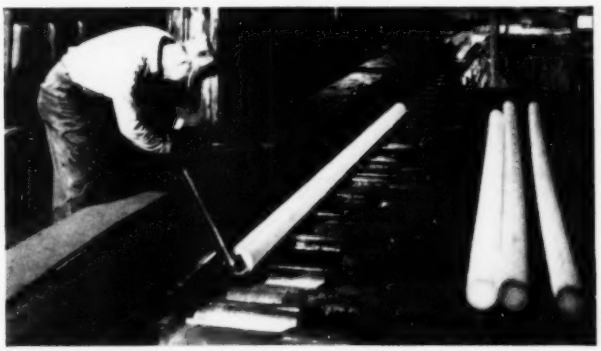
THIS NUMBER SAYS A MOUTHFUL. HM89446—HM89410 tells the dimensions of a certain tapered roller bearing, often used in pinions. Quite a lot for a number to say. But when it's a *Timken* bearing number, it tells some *extra* tales of quality and service . . .

Look what you can say with numbers



THIS EXTRA SERVICE paid off for one well-known axle manufacturer. Using his front axle in our physical laboratory we ran bearings under simulated maximum driving loads. Result: Timken Company engineers were able to show the manufacturer how to get longer bearing life.

AN EXTRA STEP that goes into the making of every Timken® bearing: honing the races to a super smoothness. The result shows up in the moving parts of your car . . . the vital zone. On pinions, for example, the super-finish helps Timken bearings maintain their original setting. Gears run quieter and last longer.



AN EXTRA PRECAUTION taken by the Timken Company is the making of its own steel. No other bearing company does this. Above, a billet is stamped to identify the heat and ingot it came from, assuring closer quality control. Don't just specify a bearing number. Specify "Timken" too. And for *full* value, use a Timken bearing cup with a Timken bearing cone. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN is number 1 for VALUE where value counts most: in the vital zone

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⓪ AND THRUST →⓪← LOADS OR ANY COMBINATION →✳←